JPRS-WST-85-012

10 April 1985

West Europe Report

SCIENCE AND TECHNOLOGY

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WEST EUROPE REPORT

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ADVANCED MATERIALS

BRIEFS

METAL MATRIX COMPOSITES PROCESS--Rheomolding is a process for forming alloys in a semi-liquid, semi-solid condition; it makes use of the very fluid nature of these alloys when they are subjected to intense mechanical agitation during solidification. This agitation technique also allows the formulation of new materials through the addition of foreign particles or fibers designed to improve their properties. Thanks to an ANVAR (National Agency for the Implementation of Research) aid to innovation, the GPMM laboratory is currently completing the development of a rheomolding prototype for formulating such metal matrix composites. The device should make it possible to: (i) characterize basic alloys before and after mechanical agitation, in order to determine optimum conditions for the addition of particles or fibers; (ii) optimize the nature, size, shape, and amount of particles, as well as the addition sequence, so as to achieve the properties desired after formulation; (iii) study the possibilities for shaping these composites in a semi-solid condition, using original processes or modifying those used for completely liquid or solid states, so as to benefit from the particular properties of rheomolded alloys. [Text] [Paris COMPOSITES ET NOUVEAUX MATERIAUX in French Nov 84 p 10] 11,023

RENAULT TESTS ENGINE CERAMICS--Renault will soon test ceramic components in a two-stroke engine. Tests completed so far on conventional four-cycle engines are not very conclusive. The lifetime of components does not exceed one hundred hours. The use of a simpler engine should allow a better utilization of results. Renault's industrial activities with this family of materials are concentrated around the former Ceraver team. The new hub, named Ceratec, also includes Snias and the American specialists Norton and Carborundum. Next year, Renault will invest 30 million francs in technical ceramics R&D. In any case, no mass production applications can be expected before 1990. [Text] [Paris INDUSTRIES & TECHNIQUES in French 10 Dec 84 p 9] 11,023

NEW COMPOSITE AT VOLVO--Developed by Jutongruppen, the leading Scandinavian plastics manufacturer, the Norpol Polymer Alloy is used for the body of the Volvo LCP2000 prototype. The new material meets the manufacturer's specifications for rupture elongation, tensile resistance, flexion strength, rigidity, shock resistance, and surface finish. Its maximum thickness is 2 mm. To achieve competitive prices, a new method of direct molding has been formulated. It eliminates the preparation and purification of reinforcing preimpregnated materials. [Text] [Paris INDUSTRIES & TECHNIQUES in French 10 Dec 84 p 8] 11,023

CSO: 3698/316

AEROSPACE

SWEDISH REPORT ON RECENT ESA MEETINGS IN ROME

Stockholm SVENSKA DAGBLADET in Swedish 5 Feb 85 p IV

[Article by Johan Myrsten]

[Text] Brussels--"Europe Lifts off for Space." There were many enthusiastic headlines following the ESA [European Space Agency] ministerial meetings in Rome, where the guidelines through the year 2000 were adopted for joint European investments of many billions in such things as the Ariane 5 rocket, the Columbus space laboratory, and the Hermes space shuttle.

It was also decided at the meeting in Rome to increase the budget for joint basic research using space satellites, for example, by 5 percent annually between 1985 and 1989. The decision was greeted with pleasure by the Swedish delegation headed by Under Secretary Kerstin Nibleus.

Several of the research ministers participating in the meeting stated afterward that West Europe had now decided seriously to seek its own independent place in space developments. Italian Minister Granelli described the decisions reached at the meeting as "historic," and French Minister Curien talked about a "decisive stage."

Eurospace, which is a group of about 40 companies and banks in the space industry, estimates that the ESA may win 20 percent of the world market for satellites, launches, and related services by 1993 if the guidelines drawn up at the meeting in Rome are subsequently transformed into definite decisions and projects. Among the companies now hoping for more orders are the Saab Space Corporation, the Volvo Aircraft Engine Company, and Ericsson.

The general exhilaration following the meeting in Rome last Wednesday and Thursday also results from the fact that the FRG, Italy, and France managed to resolve their conflicting interests or at least to set them aside until later. France, which with Swedish and other support has long emphasized that Europe must stand on its own two feet in these matters, gained a hearing for the idea of developing a new and heavier version of the Ariane rocket.

At the same time, the FRG and Italy, which have had no objections to cooperating with the United States in space, gained support for the big Columbus project. That project will result in a series of manned space laboratories, platforms,

and modules designed primarily to be attached to the big manned space station that the United States hopes to have placed in a fixed orbit around Earth in 1992--the year when the 500th anniversary of the discovery of America by Columbus will be celebrated.

The Columbus project is a further development of the Spacelab venture of the 1970's. But unlike Spacelab, the Columbus platforms will not be tied to the U.S. space shuttles. Instead, they will be able to maneuver independently in space. Their chief purpose is to serve for experiments with weightlessness. One sum mentioned as the estimated cost of Columbus over the next 10 years comes to nearly 20 billion kronor. It is said that the U.S. station will cost at least four times that much. The British, who at this meeting showed a greater interest in the ESA than they had previously, are planning a variant of the Columbus that will follow an orbit over the poles.

Twice as Powerful

Ariane 5 will be twice as powerful as its immediate predecessors, and its cost will be of the same order of magnitude as that of the Columbus. The first launch is expected in 1994 or 1995--that is, a little over 20 years after Ariane's first launch in 1973.

Hermes is planned as a smaller version of the reusable space shuttle that the United States has made successful flights with in recent years. It is expected to make its first flight in 1997 with Ariane 5 as its launch vehicle.

A fourth project that is still in the idea stage was mentioned by the British at the meeting. It concerns a contemplated space transport that will be able to take off and land like an airplane.

"It is a good feeling to know that the ESA now has a basic program or, more accurately, a list of programs that will last until the turn of the century. The program that was drawn up in the 1970's has been almost completely used up by now," comments one of the Swedish participants in the meeting who heads the government's space delegation, Jan Stiernstedt.

"We are pleased that we managed to get the budget for the basic research program increased by 5 percent. For one thing, basic research gives Swedish researchers the opportunity to take part in European space research, and for another, it makes demands that stimulate development in Sweden."

The annual budgets for the ESA's basic research will amount to a total of just over 1 billion kronor by 1989, and Sweden's share will be 43 million kronor, compared to 35 million kronor in 1984. Sweden's contribution to the ESA's basic budget will rise from last year's 28 million kronor to 32 million kronor in 1989. Including its contribution to the projects, the Swedish Government paid a total of about 140 million kronor to the ESA last year, and that corresponds to just over 2 percent of all ESA activities. In general, those sums are to be proportionate to the share of the projects going to Swedish firms. Volvo and SAAB [Swedish Aircraft Company] are involved primarily in the Ariane project, while Ericsson is involved in various applications projects.

Invitations To Participate

The principle governing all ESA projects is that the country or countries taking the initiative in a particular venture invites the others to join in, and they then participate to the extent of their interest and their resources. For example, France has paid for just over 50 percent of Ariane, and the FRG paid for about 60 percent of Spacelab (and 20 percent of Ariane).

The ESA was set up in 1975 and has 11 member countries. Besides the three that have invested the most to date (France, the FRG, and Italy) and Great Britain, those countries are Sweden, Denmark, Holland, Belgium, Switzerland, Spain, and Ireland. In addition, Norway, Austria, and Canada have partnership or cooperation agreements with the ESA.

11798
CSO: 3698/293

AEROSPACE

FRG COMMENTARY ON RECENT ESA MEETINGS IN ROME

Duesseldorf WIRTSCHAFTSWOCHE in German 8 Feb 85 pp 30, 33

[Article: "Space Research. Nearer the Goal"]

[Text] Europe's ministers of research have agreed upon a joint program for pursuing manned space flight. They showed amazing willingness to provide funds. Only France balked momentarily.

The German concepts of space research have been "approved at the European level," beamed Wolfgang Finke, director of the Federal Ministry of Research, following the conclusion of the two-day minister's conference of the European Space Agency (ESA) held at the end of January in Rome, "Ariane 5 is off and running, the Columbus project has been given the green light and the French Hermes project has for the moment been postponed."

For the Europeans manned space flight is a foregone conclusion. The question of whether unmanned stations might achieve comparable or even better results was not even discussed by the ministers.

However, to what extent the concluding document released by the European research ministers actually reflects such a clear-cut German victory remains to be seen.

But one thing is certain: With much less friction than originally feared Europe has moved a clear step closer to its ambitious goal of becoming, after the U.S. and the USSR, the third major power in space.

Understandably, there was no problem dealing with the individual agenda items according to Luigi Granelli, the Italian research minister: "There are not only political but above all also economic interests behind the ESA. Industry wants space flight which will bring large contracts and create jobs." Not least of all therefore, they have decided to increase the return quotas of each country's contributions to national industry from the current 80 percent to 90 percent initially and later even to 95 percent.

The group of ministers quickly agreed on future funding of the ESA. The organization's budget will increase from the current 1 billion to 1.65 billion European accounting units (approximately DM 3.7 billion) by the end of the

decade. Over the objections of the British in particular, a real growth rate of five percent annually was agreed upon for the scientific budget which is concentrated in research in the areas of telecommunications, weightlessness and space technology--a decision which was hailed above all by the Germans. There had been great anxiety, according to a member of the delegation, that the willingness of the Europeans to pay for scientific research might have declined in the face of these expensive technical programs.

According to the mandate by the ministers to the ESA, the HM60 engine to be developed by MBB and Fiat will have lifted the newest European rocket, Ariane 5, into orbit within the next decade. Of the total cost of about DM 7.5 billion, Bonn will provide DM 1.7 billion (22 percent). France will supply 53 percent of the Ariane funds. The current pride of the European space industry is the manned station Columbus, also valued at DM 7.5 billion, which as of 1992 will orbit the earth and will be compatible with the planned American NASA stations.

The FRG will have a 38 percent share in this project which involves four individual modules. Similar to the French handling of Ariane, the Germans have also assured themselves supervision of the whole system. The go-ahead for Columbus, said Federal Research Minister Heinz Riesenhuber after the conference, could even be given now: "The FRG, Italy, England, Denmark and Belgium have already earmarked a total of 83.5 percent of the necessary estimated funds." The willingness of the Europeans to pay for Columbus is so great that Minister Granelli even calculates excess funding at about 110 percent.

And finally, as conference participants have interpreted French statements, Paris will also participate in the space station. Said one member of the German delegation, "They just tried a little blackmail: Help us with our Hermes project and we will go in with you on Columbus."

The reuseable spacecraft Hermes, planned by the French, is a point of contention in the current discussions involving the philosophy of future European space flight. In keeping with the logic of its post-war policy Paris has demanded "absolute autonomy and independence" for the ESA. "Europe is financially and above all technically in a position to run its space program without the Americans," France's research minister Hubert Curien tried to convince his ten colleagues. And in order to round out the existing program, he said, Hermes had to be built. Diametrically opposed, Minister Riesenhuber argued that, "European autonomy can only be achieved through close cooperation with the U.S." The Germans and along with them the British, for example, have an argument not to be dismissed lightly: In order to ensure future transfers of high technology, not only in the field of space flight, the Americans must be included in European projects.

The ESA ministers found a Solomon-like solution to this one conflict during the conference. Hermes was included in the final protocol as an "interesting suggestion." The preliminary studies by the French will be distributed to the other partners. Belgium and Italy will--"firstly because it is not a bad idea, but also because we did not want the French to lose face," said Minister Granelli--participate in these studies.

At the same time however ESA Minister President Gijs van Aardenne was requested to express in a letter to U.S. President Ronald Reagan the intention of the Europeans to accept Washington's offer of cooperation at the beginning of January "under certain conditions." At the same time however Europe, which could not even financially support a third major program in addition to Ariane 5 and Columbus, is leaving all its other options open--even for the surprise suggestion by the English at the Rome conference for a reuseable rocket which would start and land like an airplane. "And who knows," said Finke, "what we won't think of next."

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CSO: 3698/279

AEROSPACE

SWEDISH PARTICIPATION IN EUROPEAN SPACE PROJECTS OUTLINED

Stockholm SVENSKA DAGBLADET in Swedish 9 Feb 85 p 6

[Article by Lars Hellerstedt]

[Text] (TT)--Europe will take part in building the first permanent space station. Sweden may get in on a little corner of that space venture, which will cost astronomical sums to carry out.

NASA, the U.S. space administration, is planning to launch the first permanent manned space station in 1992 to honor the 500th anniversary of the discovery of America and Columbus' achievements.

The total cost of that commemorative rocket will come to about 75 billion kronor for the United States.

In addition, the ESA [European Space Agency], a space organization consisting of 11 European countries, has decided to build its own station to be attached to the American platform. The European station, christened Columbus, will be 10 meters long with a circumference of 4 meters.

The European Columbus will cost about 20 billion kronor.

Both the American station and Europe's Columbus will be launched into space on the U.S. space shuttle, which can carry 20 tons on each launch.

In a second stage, Europe's Columbus can be detached from the parent platform and maneuver independently. The little Columbus will be unmanned at first, but later it will be able to accommodate European researchers.

Columbus is a sequel to the earlier space shuttle flight known as Spacelab, which was a cooperative effort between NASA and the ESA.

Sweden, which is a member of the ESA, did not participate in the Spacelab project, and it is not likely that it will be able to take part in the Columbus project. But that question has not yet been decided. Sweden may receive an invitation later to participate in the space station as a part owner.

On the other hand, Sweden is participating in another project for which France is responsible. Called Hermes, it involves a miniature space shuttle that is being developed as part of something called the Ariane V project. It will be launched from Devil's Island off the coast of French Guiana.

Sweden is taking part in the development of Ariane V, participating in the building of the engine, and investing 50 million kronor over a 3-year period in that development.

Hermes will aim at flying to the Columbus space station.

It is true that the chief intention with respect to the Columbus is to use the station's weightlessness to carry out various lab experiments that are impossible on Earth.

But the station's cameras can be aimed at Earth for remote sensing in connection with weather forecasting and crop predictions.

Its electronic eye can also be aimed into space for making clear astronomical observations not distorted by the Earth's atmosphere, which is difficult to penetrate.

11798
CSO: 3698/293

CIVIL AVIATION

AIRBUS CONSTRUCTION DISTRIBUTED AMONG AEROSPATIALE PLANTS

Saint-Nazaire Makes A 320 Section

Paris AEROSPATIALE in French Feb 85 pp 12-13

[Article: "Saint-Nazaire: Full-Scale Mockup of the A 320 Front Section"]

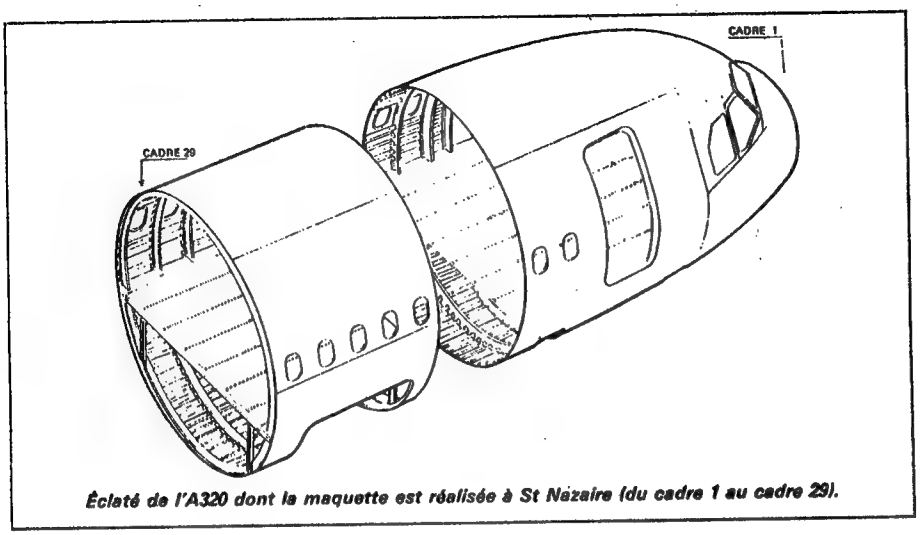
[Excerpts] After making the mockup of the assembly consisting of the wing carry-through structure and main landing-gear wheel well of the Airbus A 300, A 310 and A 300-600, the Aerospatiale Saint-Nazaire factory was asked to make a mockup of the front section of the A 320. This will make it possible to save valuable time on the manufacturing cycle of the first units.

The so-called "class-2" metallic mockup, which in the case of the Airbus A 320 will consist of sections 11-12 and part of section 13-14, will be geometrically identical to future equipped structures; it offers special technological interest in that it includes the cockpit, the front landing-gear well, an essential portion of the cabin air-conditioning and climatization system and, in addition, in that all the equipment indispensable to pilot the aircraft will be installed.

The typing and development of the essential parts and organs of the aircraft, the creation and demonstration of fabrication and front-positioning tools that were made using this full-scale mockup (diameter: 4 m; length: 8.865 m; weight: about 3.5 tons) required about 100,000 hours of work.

Important Participation

During the development stage, then in mass production, the Aerospatiale Saint-Nazaire factory will make the elementary parts and mount the subassemblies for the front-section cabin floors and landing-gear well (sections 11-2) as well as for the upper fuselage panels of sections 13-14. In addition, the factory will also be in charge of assembling and integrating systems for the above-mentioned sections--joined together--and formed of the subassemblies supplied by the company's Toulouse, Nantes and Meaulte factories.



Éclaté de l'A320 dont la maquette est réalisée à St Nazaire (du cadre 1 au cadre 29).

Exploded view of the A 320 whose mockup is being made in Saint-Nazaire (bulkeads 1 to 29)

This will represent about 20 percent of Aerospatiale's share of the A 320 program and will provide a workload for 400 people, i.e. about 16 percent of the Saint-Nazaire personnel, during 1986 and subsequent years, assuming a production rate of 3 units per month, in 1988, with a foreseeable objective of 6 per month by 1990.

PHOTO CAPTIONS

1. p 13 Above left: completed mockup structure, technical installations (systems) during assembly. Above right: mockup of the Airbus A 320; inner structure; cockpit and cabin floor being assembled. In the rear, bulkhead No 1. Under the floor structure, the landing-gear well.

Automated Riveting at Nantes

Paris AEROSPATIALE in French Feb 85 pp 14-15

[Article by Evelyne Boury: "Nantes: Automated Assembly"]

> [Excerpts] Automatic installation of a rivet in 6 seconds instead of 40 seconds by hand, automatic drilling of Airbus or ATR 42 panels, this is now done everyday at the Aerospatiale Nantes factory. Thanks to two new ultra-high performance "French-made" machines recently placed into service. They are already working on the A 320.

The arrival of the two new numerically-controlled machines was for the Nantes factory, specialized in making wing-fuselage junction structures for the Airbus and the ATR 42, the opportunity to achieve a breakthrough in the field of assembly automation.

These are two high-performance machines. One is a Recoules five-axis automatic riveting machine, the other a Cepede automatic drilling machine for Airbus panels.

These acquisitions are part of Aerospatiale's investment policy aimed at renovating and improving its machine-tools inventory. They proved indispensable, especially in times of difficult economic conditions, when manufacturers must keep innovating to remain competitive.

One Rivet in 6 Seconds

Designed by the Recoules company, a small or medium-size firm established at Ozoir-la-Ferriere (Seine-et-Marne), the dedicated five-axis numerical-control riveting machine will be used to rivet fuselage section panels for the new 150-seat Airbus, the A 320, as well as wing panels for the ATR-42.

Its originality is that it can drill and rivet curved panels, such as those of section 11-12 of the A 320. For the ATR-42, the machine rivets wing-end spar boxes.

With this unit, the riveting cycle is of the order of 6 seconds instead of 40. The cycle includes all operations in succession: clamping, drilling, sealing, rivet introduction, flattening and blankholder removal. The machine then automatically goes on to the second riveting point, and so on, until the rivet line is completed. It requires a single operator.

For the Recoules company that developed it, the machine is a European first.

A Single Drill

Another first, for France, is the installation of another machine, also numerically controlled, designed by the Cepede company of Saint-Cere (Lot)

for the automatic drilling of large-size structural elements (6 m x 3.9 m). It will be used to rivet the upper and lower skin panels of the wing-fuselage junction section of all Airbus versions (A 300, A 310, A 300-600 and A 320) and the wing panels of the ATR-42.

This machine will also considerably improve productivity and working conditions. Until now, the drilling cycle of the A 300 panels was manual and required seven people working under difficult conditions. With this machine, two operators can do the drilling in a single operation. The drilling order, which involved several tool passages, now requires only the passage of a single drill.

The installation of these two high-technology machines is the result of close collaboration between the manufacturers and the user.

For the Aerospatiale Nantes factory, this new investment (FF 7 million) constitutes an example of the industrial development efforts undertaken in recent years to innovate, modernize and automate.

9294
CSO: 3698/310

CIVIL AVIATION

FRENCH LABORATORIES TO WORK IN TURBINE ENGINE RESEARCH

Paris DEFENSE NATIONALE in French Feb 85 pp 127-138

[Article by Philippe Ramette]

[Excerpt] In the Science and Defense Section, we are opening a "propulsion" file which will be the subject of several articles. The first of them was written by Philippe Ramette, head of the Thermal Machines Division in the Research Department of the Directorate for Research, Studies, and Technologies (DRET).

VIII. Research Centers

Before beginning the design of a new engine, the utilization of the results obtained by the various turbine research projects which we examined, requires the completion of exploratory work that will verify on subassemblies or experimental engines, the mechanical and aerodynamic compatibility of various components, the soundness of the general architecture concepts, and the operational stability of the assembled product. Most of these exploratory projects are laying the groundwork for SNECMA's (National Company for the Study and Construction of Aircraft Engines) future military engine.

Turbine engine research in France involves a large number of diverse groups: engine builders (SNECMA, Turbomeca, and Microturbo), ONERA (National Office for Aerospace Studies and Research), research companies (Bertin, Metraflu), and several CNRS (National Center for Scientific Research) or university laboratories. New materials are studied with the participation of SEP (European Propulsion Company) and of the companies Imphy, Cezus, Aerospatiale, and Ceraver, among others. A large part of the work is done by ONERA, which is devoting about 12 percent of its activity to turbine engines. The corresponding studies are performed by the scientific directorates for energy, aerodynamics, materials, structures, and general physics, and by CERT (Toulouse Studies and Research Center) in Toulouse.

One particular aspect of turbine engine research in France is the large variety of the contributing CNRS or university laboratories. Without being exhaustive, the following list indicates the major laboratories that are involved:

For materials: the Materials Center of the Paris School of Mines, in Corbeil; the ENSEEG (Grenoble National Superior School for Electrochemistry and Electrometallurgy) Laboratory for Metallurgical Thermodynamics and Physical Chemistry in Grenoble; the CNRS Center for Metallurgical Chemistry Studies in Vitry-sur-Seine; the ENSMIM (National Superior School for Mining Metallurgy and the Mining Industry) Metallurgy Laboratory in Nancy; the Laboratory for the Chemistry of Mineral Solids at the University of Nancy I; the Welding Institute in Paris; the Laboratory for Mechanical and Thermodynamic Properties of Materials, in Paris Nord;

For mechanical design: the INSA (National Institute for Applied Sciences) Laboratory for Mechanics of Solids, Structural Mechanics, and Contact Mechanics in Lyon; the ENSET (National Superior School for Technical Education) Laboratory for Mechanics and Technology in Cachan; the Mechanics Institute in Grenoble (University of Grenoble I); the Research Laboratory for the Study and Prevention of Failures of Mechanical Origin, at the Compiegne University for Technology; the laboratories for the mechanics of solids at Ecole Polytechnique and the University of Poitiers; the ENSEM (National Superior School for Mining) Structural Mechanics Laboratory in Nantes; the Laboratory for Applied Mechanics at the University of Besancon;

For aerodynamics: the Fluid Mechanics Laboratory at Ecole Centrale in Lyon; the Fluid Dynamics Laboratory at the School of Mines in Paris; the CNRS Computer Laboratory for Mechanics and Engineering Sciences in Orsay; the Fluid Mechanics Institute in Marseille;

For combustion: the Thermal Research Group at Ecole Centrale in Paris; the ENSMA (National Superior School for Mechanics and Aeronautics) Laboratory for Energy and Detonation Sciences in Poitiers; the CNRS Center for Research in the Chemistry of Combustion and High Temperatures in Rouen; the CNRS Laboratory for Fluid Dynamics and Thermoplasticity in Marseille;

For production: the Paris School of Mines Center for the Shaping of Materials, in Sophia-Antipolis; the ENSAM (National Superior School for Arts and Crafts) Laboratory for Mechanical and Automated Production in Paris; the Ecole Normale Superieure Physics of Solids Group; the CENG (Grenoble Center for Nuclear Studies) Laboratory for Computer Electronics and Technology in Grenoble; the Laboratory for Acoustics and Signal Processing of the Compiegne University for Technology.

The various research projects are coordinated partly by the engine builders themselves (especially SNECMA), and partly by DRET. The body of research that has been presented is intended to prepare the future of the turbine engine industry in France, especially for aircraft engines, in an increasingly competitive international context.

11,023
CSO: 3698/289

COMPUTERS

CAP SOGETI OF FRANCE GETS ESPRIT FUNDS FOR AI RESEARCH

Paris ELECTRONIQUE ACTUALITES in French 7 Dec 84 p 8

[Article: "Cap Sogeti: Five Projects Under the ESPRIT Project"]

[Text] Cap Sogeti Innovation, a division regrouping the group's teams of advanced-technology experts, is developing its operations mainly under the EEC ESPRIT project [European Strategic Program for R&D in Information Technology]. "Of the FF 8 million of the division's budget for this year, FF 5 million will be spent on 5 projects originating from the Community," Mr Figer, head of the division and assistant general manager of the group, indicated at a recent press conference.

Two of these projects involve software engineering: Project 401 carried out, in particular, with the collaboration of the Pisa University; and Project 523 dealing with the application of software engineering to robotics, the partner being the Karlsruhe University.

In addition, two other projects (302 and 415) are devoted to the development of the concept of parallel programming.

The most important of these five projects, however, has to do with artificial intelligence: Project 316, developed jointly with Philips and the Edinburgh University, among others, involves interfacing between expert systems and with existing databases.

It will cost a total of FF 100 million over 5 years; Cap Sogeti will engage FF 5 million over that period but, because of the "precompetitive" outlook of the ESPRIT project, it will derive the full benefits of it. This example is a perfect illustration of the main advantage of ESPRIT which, according to Mr Figer "will enable each of us to speed up its research in new technologies, or even just to have access to them as, financially, Project 316 far exceeds the resources of Cap Sogeti," although, as is known, the latter is the leading European software house. Cap Sogeti Innovation is also active in the field of expert systems in contexts other than the ESPRIT project; among current developments, there is in particular a product made in collaboration with Renault and having to do with automobile repair.

In the immediate future, the company should soon take a closer look at computer-integrated manufacturing [CIM] applications; indeed, still under the ESPRIT project, it will be a partner in the CIM project that should be announced late this year by the EEC; this time, its partner will be IBM.

9294
CSO: 3698/312

FACTORY AUTOMATION

ALFA ROMEO AUTOMATES WITH LASERS AND ROBOTS

Rome IL TEMPO in Italian 23 Jan 85 p 8

[Article by special correspondent Giuseppe D'Avanzo]

[Text] Plants already in operation and plans on the drawing-boards at Alfa Romeo's Portello plant: Automaker using Italian-built lasers to move toward the "automated plant."

Research Minister/Senator Luigi Granelli was on hand at Alfa Romeo's Portella plant for a demonstration of the first two industrial lasers designed and built in Italy by the Study and Experimental Information Center (CISE) as part of a project to build "power lasers" sponsored by the National Research Council (CNR). There are some 200 lasers in use in industry in our country, where the automotive industry, including Alfa Romeo, has been using them for several years now; but even before CISE came out with these two, power-wave-emitters (that, to put it very simply, is what lasers are) were important.

To watch the laser in operation, as we did at Portello, can be something of a let-down. There is nothing scary or sensational to see, nothing reminiscent of the famous Sean Connery movie or of the current discussions over "star wars." All you see is a few cupboards, a few semi-cylindrical tanks, a control panel whose keyboard is simpler than that on a personal computer, and, at last, a glass-walled cubicle inside which an inverted cone silently slices, welds, and heat-treats metal for mechanical and body components, as well as some insertion tasks. The "active medium," which, when properly "excited," emits radiation that is repeatedly amplified and sent out in a narrow band of carbon dioxide. The power of each of the systems is 2.5 kilowatts of direct current on a 106-micron wavelength.

Alfa Romeo and CISE are currently working at Portello on yet another project: three laser generators powered at 2.5 kilowatts each will be fed into a special control unit that, according to what is needed, will direct radiation bands to any of five separate "work-stations," adjusting the power as required; this will

generate outputs of as much as 7.5 kilowatts of power -- which is impressive, to say the least.

What advantages can the laser boast over traditional machinery in performing these industrial operations (metal cutting, welding, heat-treating, and insertions)? Opinions as to its absolute economic benefits tend to differ, but there is no question as to the superior accuracy and precision of laser processing (Alfa Romeo, in fact, uses lasers to produce such extremely sensitive components as gears).

Vital importance is attached to lasers in the "automated plant," which, as we all know, are already in the preliminary stages of adoption all over the world.

Fitting neatly into this scenario is the project now under development at Alfa Romeo, where it is known as the "flexible manufacturing system (FMS), adopted for assembly-line production of runs ranging from 500 to 5,000 units, which will be used to build prototypes and is remarkable for its very high-level automation and integration. In essence, the same shops are used for turning, milling, and drop-forging of production parts as are used for the operations of cutting, welding, heat-treatment, and insertion using lasers. Were it not for the lasers, these operations would have to be performed, owing to sundry technical requirements, in different shops, thereby complicating the various flows and transfers of parts (for which they use automated dollies).

Regulating and controlling the whole FMS process, of which lasers are an indispensable component, will be an electronic data-processor performing a twofold function: computer-assisted design (CAD), which makes the designer's job easier, and computer-assisted manufacturing (CAM), which monitors and controls production.

This integration reminds us of what is already happening with the advanced word-processing programs: these consist of video terminals with, among other things, discs or other memory elements to store and reproduce written texts which can be shifted directly to the photoprinter. It is pretty much the same thing with the FMS: machines, be they laser or conventional, are controlled directly from the designers' terminals, all the way through the production process. Alfa Romeo engineers believe that with FMS the cost of building a prototype engine can be brought down from 311 million to 200 million lire, but even more important is the fact that the time required to build it will be cut in half -- a point that, from their point of view as well as that of the marketing people, is about as important as you can get.

The FMS may be fully operational within 4 years (though maybe 2 will suffice).

Along with the lasers, we saw the "Cincinnati Robot" in action. The "Cincinnati" is an automated machine built in the United States, but embodying an applications system developed by Alfa Romeo. Once entered into "Cincinnati's" memory, a picture of any desired piece can be flashed before the robot's TV "eye," and it will move unerringly to the right place to pick out, even from dozens of almost identical parts, the specific one that is wanted.

6182

CSO: 3698/285

FACTORY AUTOMATION

THREE-COUNTRY STUDY ON INDUSTRIAL USE OF MICROELECTRONICS

Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 6 Feb 85 p 14

[Article: "Industry Recognizes Advantages of Microelectronics: FRG Leads in Europe. Few Jobs Eliminated. A Study"

[Text] (J.RH.) London, 5 Feb--The material processing industry in Europe has learned to appreciate the advantages of microelectronics more and more and is making increasing use of it in order to improve both products and production processes. Some jobs are indeed eliminated, but their number is so low as to be almost negligible. These were the conclusions of a joint German-British-French study on the uses of microelectronic components in these three countries. The British-German Foundation for the Study of the Industrialized Society and the Technology Center of the VDI (Association of German Engineers) were involved on the German side, with the Policy Studies Institute on the British side.

Up to now the material processing industry in the FRG has made greater use of the potential of microelectronics than has been the case in England and France. Based on a study of 3800 plants in the three countries it is estimated that microelectronic components are used in 51 percent of all West German industrial plants having more than 20 employees. In England this is true for 47 percent and in France for 38 percent of all enterprises. In all three countries the use of microelectronics is rapidly increasing, which has lead to the elimination of 77,000 jobs in these three countries combined within the past two years--35,000 in England, 30,000 in the FRG and 12,000 in France. This amounted to a total of less than five percent of all jobs which were lost in the material processing industry during this period. How many jobs are being created elsewhere within the economy as a result of the use of microelectronics, in the production of software for example, was not investigated in the study.

A number of reasons were put forward as to why even greater use is not yet being made of microelectronics in industrial production: A general lack of technical experience was found in all three countries. Enterprises within the FRG also complain of too little in the way of suitable software, the input material for the controls for solving tasks that the devices are to perform.

Union resistance to technical innovations played a subordinate role in all three countries. In England many businessmen give as another reason the overall poor economic situation, while a general aversion to microelectronics by upper management apparently played a role only in a few cases.

12552
CSO: 3698/280

FACTORY AUTOMATION

FUNDING SOURCES, ORGANIZATION OF CAD/CAM RESEARCH IN FRG

Bern TECHNISCHE RUNDSCHAU in German 9 Oct 84 pp 9, 12, 15-19

/Article by Prof Dr Eng Dr H. C. Guenter Spur, Fraunhofer Institute for Production Systems and Construction Engineering, Berlin/

/Excerpts/ The importance of technology will continue to increase for future economic development. High technologies such as microelectronics, information processing, and production automation will largely determine economic growth as well as the future of society during the coming years.

In relation to the gross national product, private and state expenditures for science, research, development in 1983 in the Federal Republic of Germany amounted to a total of 46.8 billion DM. Of this, private businesses contributed 26.3 (56.2 percent), the federal government 12.1, the provinces 7.7, and other agencies 0.7 billion DM (Figure 2).

In an international comparison, research funding in the area of information technology, for example, also lagged behind in the Federal Republic. To maintain the competitive position, the funding of the information industry cannot remain limited to research and development, but must be reinforced by government contracts, loss compensation, and joint strategic actions by business and government.

Figure 2. R&D expenditures in the Federal Republic of Germany 1983

The Total of 46.8 Billion DM

Were Paid By		Were Received By	
Other	2%	Colleges	16%
Provinces	16%	Other	17%
The Federal Government	26%	Institutions	
Business	56%	Business	67%
Total	100%	Total	100%

Research Funding in the Federal Republic of Germany

In the Federal Republic, research and development in the area of production engineering are wholly or partly funded by various public agencies. A distinction can be made here between direct and indirect funding. Direct funding can concern specific institutions, for example colleges, the German Research Association (DFG), the Fraunhofer Society (FhG), the Working Community of Industrial Research Associations (AIF), or it can be granted for selected research and development projects, for example technical programs of the BMFT (Federal Ministry for Research and Technology). Indirect funding consists of tax breaks and benefits for businesses and jointly used research facilities, or of tax breaks or financial aid for innovations, if they satisfy specific criteria.

The principle of scientific freedom is maintained through the pluralistic structure of government funding. A distinction is to be made between research funding institutions and research institutions.

The German Research Association (DFG) funds production engineering especially within the framework of its central programs and special research areas (about 20 million DM annually).

As a rule, the central programs finance and coordinate five-year projects of several researchers at various locations, in connection with a particular topic or project.

Special research areas are long term (12 to a maximum of 15 years), but they are not permanently organized research facilities in colleges, where scientists from several disciplines work together within the framework of an interdisciplinary research program. The following special research areas (SFB) which have been funded are important for production engineering:

- SFB 55: Production engineering, Aachen
- SFB 57: Production engineering and automation, Berlin
- SFB 155: Flexible production systems, Stuttgart
- SFB 158: Assembly in flexible production operation, Stuttgart
- SFB 203: Computer-aided design models in machinery, Berlin
- SFB 208: Flexible handling equipment, Aachen

The special research area 57 is coming to a close. Its research objective was the implementation of a comprehensive rationalization concept for the entire production process. The research comprised a development of several CAD systems, from simulation models and methods to automated quality control.

Figures 6 through 9 show examples from the work of the special research areas 158 and 203. Thus, in the SFB 158, component project C1, the foundations are being worked out for the construction and use of flexible automatic assembly systems. Figure 6 shows conceptions for an experimental system. The objective of the component project C6 is to deliver to the flexible assembly systems

suitable sheet metal parts or subassemblies with various geometries that are shaped by joining processes.

Figure 8 shows the rough concept for a system of experts who are designing tool machines, which was worked out in the FSB 203, component project B3. Display possibilities of machine design have already been implemented for the user interface, by means of predefined geometry macros on the basis of an available 3D-geometry software (COMPAC).

Especially in view of basic research, foundations are also included among the institutions for research funding within the economy. Among the foundations, the "Volkswagenwerk Foundation" and the "Fritz-Thyssen Foundation" are the best known. The funding of the Volkswagenwerk Foundation concentrates on the development of "process models for cutting and shaping production methods."

Industrial joint research is largely supported by the Working Community of Industrial Research Associations (AIF) and by the Federal Ministry for Business (BMWI) (1983: 85 million DM). Currently, more than 25,000 enterprises are directly or indirectly organized within the 91 industrial specialty areas. The funds made available by them (in 1983, about 240 million DM), together with federal funds, are used to fund practical scientific-technical research and development. Besides the members of AIF, enterprises with yearly sales less than 50 million DM and enterprises with less than 500 employees have the right to apply for personnel cost subsidies. In 1983, more than 8,200 enterprises applied for more than 422 million DM personnel cost subsidies.

Research Institutions in the Federal Republic of Germany

A division of work exists among the research institutions. The colleges carry on research in all individual disciplines. Not only a significant portion of basic research is performed here but also an important amount of applied research and development. Besides financing for their teaching operation, the colleges receive so-called third research funds. The funding agencies are the DFG, the BMFT, the federal and provincial ministries, foundations, and business. Examples of CAD development in colleges are the following:

CAD systems:	DETAIL, RUKON, RWTH Aachen
	COMVAR, COMAID, COMPAC, the module GEOMETRIE, TU Berlin
	PROREN, RU Bochum
	DICAD, U Karlsruhe
Work planning systems:	AUTAP, DISAP, RWTH Aachen
	AUTODAK, CAPSY, TU Berlin
	DREKAL, U Hannover
	ARPL, U Stuttgart

Figure 11. Setting up a working plan with the Drekal system.

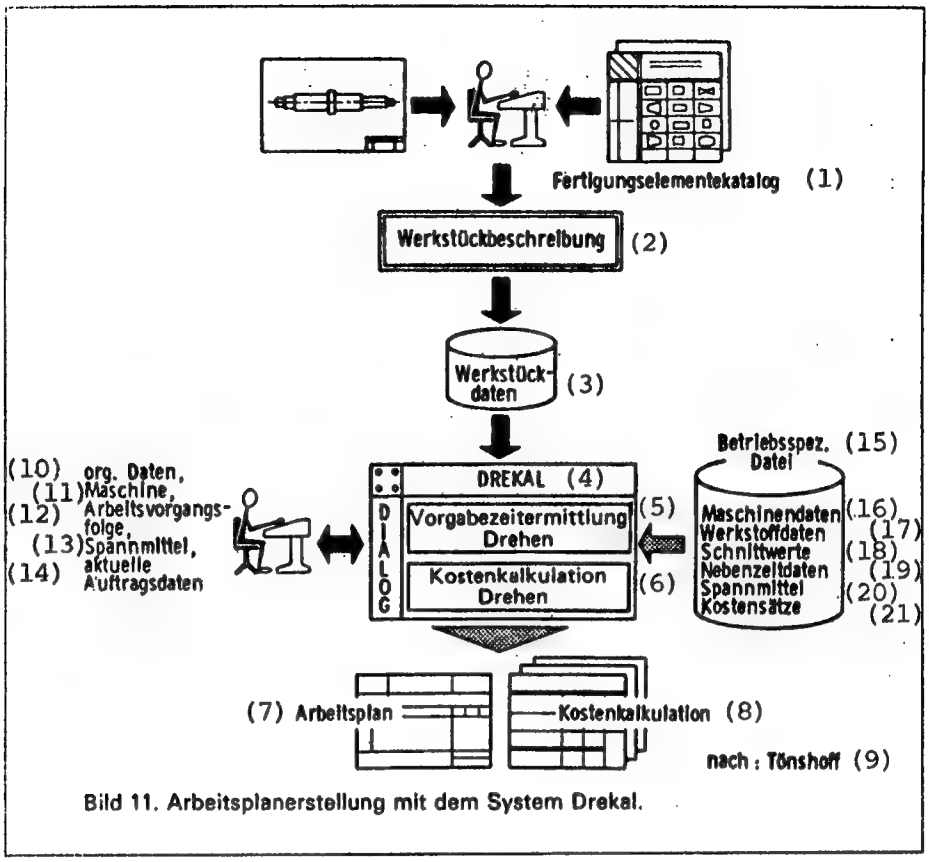


Bild 11. Arbeitsplanerstellung mit dem System Drekal.

Key:
1 - Catalog of production elements
2 - Work piece description
3 - Work piece data
4 - Drekal
5 - Time determination for lathe work
6 - Cost calculation for lathe work
7 - Work plan
8 - Cost calculation
9 - Source: Toensoff
10 - Original data
11 - Machine
12 - Sequence of working steps
13 - Mounting means
14 - Current order data
15 - Enterprise-specific file
16 - Machine data
17 - Material data
18 - Cross-over values
19 - Auxiliary time data
20 - Mounting means
21 - Cost rates

Besides the colleges, management organizations such as the Max Planck Society (MPG) for basic research or the Fraunhofer Society (FhG) for applied research focus their research on selected areas. These organizations generally work under self managment, to divide the funds among technical areas, institutes, and individual projects. The FhG carries on research and development under contract with business and government agencies, in order to convert the results of basic research to practical application. The institutional funding of the FhG furthermore makes it possible to work on self-selected research topics and to keep a steady eye on technological development lines.

The Institute for Production Systems and Construction Engineering (IPK) is one of 32 institutions of the Fraunhofer Society. Among other things, CAD introduction strategies are being developed here for enterprises of medium-sized industry. The objective of these strategies is the systematic preparation and introduction of the CAD technology as well as the selection of suitable CAD systems for the particular companies.

Large research institutions such as the Society for Mathematics and Data Processing (GMD) or the Karlsruhe Nuclear Research Center (KfK) are predominantly financed by the federal government. They combine basic research in certain areas of emphasis with applied research. Furthermore, they carry out scientific-technical and administrative management tasks within the framework of funding programs, as project managers of the BMFT:

- Project manager "production engineering," Karlsruhe Nuclear Research Center
- Project manager "information technology," Society for Mathematics and Data Processing

To fund the introduction of CAD/CAM systems, the CAD/CAM Laboratory was opened in Karlsruhe in 1983. As a neutral agency, it is supposed to offer an overview beyond individual specialties, concerning the opportunities of computer-aided design and manufacturing methods.

The research institutions of the federal government and of the provinces are also dedicated to basic and applied research. They are assigned to individual ministries and are working out decision aids in conjunction with their departmental tasks.

Funding Programs for Production Engineering

Production engineering is one of the research areas which, in the future, will be quite heavily funded by federal means. The annual percentage rate of increase here will be about 37 percent on the average. However, the funding of this area belongs only among the comparatively "small" research focal points, which number 23 all together.

The focal point of the funding program for production engineering (1984-1987), which has been running since January 1, 1984, is an introduction of CAD/CAM systems. The funding program comprises three components:

- Indirect-specific funding of development work in the production engineering industry, in order to
  - Speed up the application of CAD/CAM and
  - Broaden the base for the utilization of industrial robots/handling systems
- Funding of joint products (the development of machinery and methods for flexible production and quality control are emphasized here)
- Technology transfer and an estimation of technological consequences

More than 1,200 applications have already been submitted (status as of June 1984) for the area of indirect-specific funding. Of these, 1,059 concern the topic of CAD/CAM and 155 concern the topic of handling systems/industrial robots. On the basis of the copious influx of applications, the program was upgraded by 100 million DM, so that 450 million DM are available between 1984 and 1987.

Eighteen percent of the applications for CAD/CAM and 10 percent of the industrial robot funding will go to large enterprises with more than 1,000 employees. Corresponding to the distribution of applications, the CAD/CAM funding will emphasize businesses with a size of 200 to 500 employees (24 percent of the applications) and funding for industrial robot applications will emphasize small businesses up to 50 employees (44 percent of the respective applications).

Two phases are distinguished in the introduction of CAD/CAM: the analysis phase and the procurement of hardware and software as well as training measures. Most phases can be funded with a maximum of 40 percent of the invested sum. The upper limit per enterprise is 400,000 DM altogether.

The joint projects are supposed to solve supervening questions by way of a collaborative work division between businesses and research institutes. These also include international projects such as, for example, the APS (Advanced Production System). This is being developed jointly by German and Norwegian agencies. The project was started in 1981 and has been set up for 10 years. At the present time, 40 scientists are working on it. They are trying to use CAD/CAM to achieve comprehensive integration of larger task complexes, such as design, calculation, drawing, work preparation, and NC data acquisition. The participants include several Norwegian and German system vendors, as well as the SI Institute (Oslo) and Sintef (Trondheim) in Norway and the IPK (Institute for Production Systems and Construction Engineering) (Berlin) and the WZL (Aachen) in the Federal Republic.

Outlook

The utilization of CAD/CAM systems is becoming more and more important for the processing industry. In the future, computers will be used even more, so as to remain competitive. By 1986, growth rates of 30 to 40 percent are expected.

On an international comparison, the CAD/CAM installations in the Federal Republic of Germany are quite modest. For this reason, government funding has the goal of speeding up the application of these systems. Here, it is necessary to keep a constant eye on further development, to do justice to the dynamic development tempo. Thus, the application of new discoveries of information science, such as the technology of knowledge or the computer architecture for distributed systems, appears promising for the future of CAD.

Source: Guenter Spur gave this paper on September 28, 1984, on the occasion of the CAMP 1984 in Berlin (organizer: Exhibit and Fair Congress GMbH, Berlin).

8348
CSO:3698/196

FACTORY AUTOMATION

EXPORTS, PROTECTIONISM AFFECT 1984-85 FRG MACHINE TOOL FIRMS

Bern TECHNISCHE RUNDSCHAU in German 9 Oct 84 pp 42-43

[Article based on a statement by Helmut von Monschaw, director of the VDW [Association of German Machine Tool Manufacturers], at the opening press conference for the AMB in Stuttgart]

/Excerpts/ Since time immemorial, the Federal Republic of Germany has been Switzerland's major trade partner. It therefore should be of interest how one of the key industries, machine tool construction, is developing there. The quoted figures are averages. The figures for individual enterprises can be quite different, therefore -- positively or also negatively.

The severest recession of post-war times has also severely afflicted the German machine tool industry. But since the beginning of 1985, things have been looking up again.

In 1983, German machine tool production declined by 4 percent, and in real terms even by 7.6 percent, compared to the previous year. Exports, with -11 percent, were somewhat more severely retrograde than production. Domestic sales increased nominally by the slight amount of about 2 percent, but in real terms, here too there was a decline of 1.8 percent. However, compared to the previous year, the domestic market developed somewhat more favorably than the export markets. Finally, imports declined nominally by 1 percent, and in real terms by barely 5 percent. The amount of imports in domestic consumption was slightly retrograde and, for the first time in several years, again lay barely under 30 percent.

Orders received developed even more unfavorably than production. In real terms, they declined by about 13 percent. Here, the domestic market, with -23 percent, looked significantly more unfavorable than the export market, which booked only approximately -4 percent. A concomitant reason for the strong domestic decline, however, was surely predated orders within the framework of 1982 investments. The unfavorable development in 1983 was in no way only a German phenomenon, however. Practically all competitors in the world market reported retrograde figures. For the FRG, the key data have been assembled in Table 1.

What Does the Future Look Like?

Since the beginning of this year, the trend in incoming orders seems to have changed in Germany. During the first half year, there was a real increase by 31 percent. In July, too, the trend is still increasing. Domestic orders here developed more favorably, at +37 percent, than foreign orders, at +27 percent. Naturally, it must be considered that these growth rates are based on the low base of 1983.

The good influx of domestic orders indicates that finally investments are again being made. The stiff competition on the world market in nearly all areas also forces German manufacturers to modernize their production facilities. The metal workers' strike had a very negative effect on economic development. Fortunately, it does not seem to have influenced investment decisions. However, the discussion about motor vehicles with reduced exhaust gas sometimes tended to inhibit investments, since the automobile industry has postponed investments until this question is definitively clarified.

The influx of foreign orders indicates that there, too, things are generally looking up. For example, orders from the U.S.A. have increased strongly. The American automobile industry has ambitious plans for the future -- General Motors alone will invest, by 1989, annually more than $1 billion for machine tools in the United States.

But it should not be forgotten that foreign business is also subject to some uncertainties. This primarily concerns protectionist trends, which are increasing worldwide. For example, Italy handles its investment laws for modern machine tools in a fashion that discriminates again foreign vendors. The machine tool manufacturers in the U.S.A. have recently increased their efforts to introduce import restrictions. If the U.S. president were to react positively to their petition for introducing import restrictions against machine tools, the German machine tool industry would be hard hit.

Up to now machine tool production has not yet been included in the upswing which is signaled by the receipt of orders. Because of the long run-through time and the unfavorable influx of orders in the previous year, production the first half year of 1984 still lagged 6 percent behind that of the previous year. During the first half year of 1984, exports rose by 3 percent, and in real terms by 0.6 percent. As in the previous year, the most important purchaser was the Soviet Union. As already mentioned, the U.S.A. exhibited strong growth, although from a very low base. A noteworthy feature is a strong decline of exports to France, which has slid to fourth place of the purchaser countries.

The product prices for machine tools rose by 3.2 percent in the first half year of 1984. The rise of list prices thus has continued to weaken.

Unless there are unforeseeable events, the good influx of orders should also continue during the coming months. Probably production will increase during the second half year of 1984, so that the minus of the first half year can be cancelled. Accordingly, production should be at least 9.5 billion DM.

The year 1985 probably will again bring real growth rates to German industry. the necessity of modernizing, and thus of investing, will persist worldwide. Machine tool construction will certainly participate suitably in this increasing investment in equipment. The German machine tool companies have strongly pushed their developments during the past years and technologically belong among the world leaders. They will enter the increasingly severe international competitive battle well equipped.

Table 1. Important figures concerning German machine tool construction for the years 1980 through 1983.

	Millionen DM (1)				Veränderung(2) in Prozenten	
	1980	1981	1982	1983	1983	1982
	nominal				nominal	real
Produktion (4)	9 888	10 272	9 789	9 401	- 4,0	- 7,6
Prozente Export (5)	6 185	6 741	6 280	5 829	- 7,2	- 10,8
= Inlandabsatz (6)	3 703	3 531	3 509	3 572	+ 1,8	- 1,8
+ Import (7)	1 807	1 751	1 512	1 497	- 1,0	- 4,6
= Inlandverbrauch (8)	5 510	5 282	5 021	5 069	+ 1,0	- 2,6
Auftragseingang (9)						
insgesamt (10)	10 762	9 321	9 151	8 258	- 9,8	- 13,4
Inland (11)	4 700	4 150	4 513	3 626	- 19,7	- 23,3
Ausland (12)	6 062	5 171	4 638	4 632	- 0,1	- 3,7
Erzeugerpreisindex (13)	Indexpunkte (3)					
1980 = 100	100,0	105,8	112,1	116,1	+ 3,6	
Export in Prozenten des Produktionswertes (14)	62,6	65,6	64,2	62,0	- 3,4	
Import in Prozenten des Inlandverbrauchs (15)	32,8	33,2	30,1	29,5	- 2,9	

Key:
1 - Millions DM
2 - Change in percent
3 - Index points
4 - Production
5 - Percent export
6 - Domestic sales
7 - Import
8 - Domestic consumption
9 - Orders received
10 - Total
11 - Domestic
12 - Foreign
13 - Producer price index
14 - Export in percent of production value
15 - Import in percent of domestic consumption

Sources: Official statistics, VDMA (Association of German Machine Construction Institutions) machine construction statistics (extrapolation).

Analysis: Technical Society for Machine Tools in the VDMA, Si/scha-M, 10 Apr 1984.

8348
CSO: 3698/196

FACTORY AUTOMATION

BMFT PROJECT DEVELOPS AUTOMATION FOR STEEL PRODUCTION

Duesseldorf VDI NACHRICHTEN in German 23 Nov 84 p 29

[Article: "New Angle in Steel Production. Continuous Production and Joining Islands Speed Production in Workshop"]

[Text] Steel production is much less automated than are other branches of industry, such as automobile production or machine construction. Individual manufacturing tasks involving many employees and unattractive, frequently hazardous workplaces are reason enough for the crisis-prone steel industry to give serious thought to streamlining its production plants. The Federal Ministry for Research and Technology therefore funded a research project with the objective of "developing continuous production equipment for small and medium-sized steel producers."

"Steel production has accepted the challenge," is how you could perhaps characterize the mood at a "steel production" forum which took place this fall at the nuclear research center in Karlsruhe for the purpose of presenting the results of a research and development project funded by the Federal Ministry for Research and Technology. The production technology section of the BMFT which is in charge of the project has its offices here. There was general agreement as to the technical merit of the developments listed, the new concepts regarding design, production and material flow, and some forward-looking solutions to the problems of information flow and control solutions in the steel production industry. The results of the R&D project "Development of Continuous Production Equipment for Small and Medium-Sized Steel Producers" not only indicate a new state of the art but also show that innovative production structures bode well for the future of steel production.

In a lively discussion economic considerations alone cast doubt upon the introduction of this new technology on a broad front--even in medium-sized firms. Investments in the millions scare this crisis-ridden industry which also as a rule has only limited reserves of its own capital.

However, the experiences of the first users in pilot projects were able to eliminate these doubts. According to these users, success should not be measured only in shorter amortization times. Being able to react more quickly to market demands, shorter throughput times, reduced stores of original material and of stocks in intermediate storage and many other considerations must also be evaluated in determining its overall benefit to companies.

Moreover, it was made clear that restructuring need not take place all at once. A step-by-step approach to increased automation, while limiting the necessary capital expenditures, could be matched with company-specific conditions.

The changes in the social structures of working processes, also associated with the new technology, were analyzed early during the project's three-year period by accompanying researchers in the social sciences and thus their input was able to be applied directly to the final concept.

The other two R&D projects introduced at the forum, "CNC sheet metal production lines" and "joining islands for large components" have not yet been completed. They also involve developments for other areas of industry outside of steel production. Steel plates and sections are assembled into large workpieces. Also involved, for example, are storage and transport facility construction, vehicle construction, machine construction and plant construction.

A significant objective of this research project is to make production steps more flexible and productive. In production structures, in which an overall concept has been lacking up to now, flexible full automation should be able to be achieved in small and medium-sized production runs by adapting the flow of material.

The central object of "facilities for the production and joining of large components" is the "joining island." Steel plates and sections, for example, come out of the automatically operated storage facilities onto separate production lines where they are sand blasted, burned, cut, stamped, drilled and marked. Via transport facilities such as roller tables and trolley conveyors and inductively controlled industrial trucks the plates and sections are moved to the joining island where industrial robots for manipulating and welding complete the fully automated assembly sequence. Requirements due to large tolerances, a great diversity of parts and low quantities necessitate new methods in control technology and programming. New developments are also necessary in sensor technology and for positioning heavy welding subassemblies.

The developments presented and discussed at the "steel production" forum show very clearly that the possibilities for improving steel production structures have not yet reached their limits. The systems installed as pilot projects are only the first step however. Only consistent application of these results, which bode so well for the future, by many potential users will have the required effect on a broad scale.

The presentations are documented in a 280-page volume of the conference proceedings which appeared as Development Note KfK-PFT-E 18. It can be obtained from the production technology section in charge of the project.

12552
CSO:3698/302

FACTORY AUTOMATION

BRIEFS

NEW TRUMPF ASSEMBLY BUILDING--At the beginning of October, following eight months of construction, a new assembly building was opened at the Hettingen branch of the Trumpf Maschinenfabrik of Stuttgart. Upon taking delivery of the new building, Berthold Leibinger, the managing partner and himself a licensed engineer, explained among other things that, "The basic principle of our company is that we recognize the importance of innovation. With this concept we were able to withstand the 1982/83 worldwide recession in this industry without losses to our company." Primarily the Trumatic line of workshop-programmable machines will be built in this new building. The reasons for the construction of this new building are the lack of space which has existed for some time in the pre-assembly and final assembly areas of the Hettingen plant, as well as the company's situation with regard to orders which has been improving for several years and which showed even further improvement this year. For the same reasons an additional assembly building was opened at the main plant in Ditzingen in May of 1983. In the Hettingen plant, primarily CNC-controlled sheet metal working machines are manufactured in addition to conventional machines. The Trumatic machine, which is to be further improved during the course of this year, can be programmed in the workshop and is additionally equipped with a graphics monitor. The new building takes up nearly 13,000 m^3 of space and has a work area of 1500 m^2. As Leibinger explained further, this company has created 600 additional jobs in Baden Wuerttemberg in the past 12 years and nearly 1000 worldwide. [Text] [Coburg MASCHINE + WERKZEUG in German 6 Nov 84 p 7] 12552

NEW ASEA R&D UNIT--The Swedish electronics and electrical engineering firm ASEA recently combined its two former research and development departments into one central R&D unit, ASEA Research and Innovation. Jan Martinsson, former head of the department for company development and strategic planning, was named director of the new unit of about 350 employees. [Text] [Bern TECHNISCHE RUNDSCHAU in German 11 Dec 84 p 23] 12552

TOYODA-RENAULT MACHINE TOOLS--Renault-Automation and the Japanese machine-tools manufacturer Toyoda Machine Works have just signed a technical agreement in the field of assembly robotics. In a communique, Renault indicated that, under this agreement, its subsidiary specialized in automation and robotization will receive Toyoda components, to be used to make small assembly robots for the automobile industry, equipment manufacturers and electric household appliances. Using these elements, Renault Automation will create a new line of products in 1985. The production goal was not disclosed, but Renault should contribute 50 percent of the added value, the French firm indicated; it thus intends to complete its present line which consists mainly of "large" electric and hydraulic robots. According to the communique, the agreement provides that Renault will get exclusive distribution rights in France and will be allowed to sell abroad without exclusive rights. However, Renault added that, for the time being, it is not considering a further extension of this cooperation, for instance the creation of a joint company. [Text] [Paris AFP SCIENCES in French 6 Dec 84 p 41] 9294

CGE CREATES CIM FIRM--CGE [General Electricity Company] is setting up the industrial structures it needs for its policy, whose goal it is to become the European leader in computer-integrated manufacturing and one of the five world leaders in that field. The group just created CGP (General Computer-Integrated Manufacturing Company) to build automated factories and large computer-integrated manufacturing systems. The nationalized CGE group is holding 60 percent of the CGP stock, and another 40 percent through its Alsthom-Atlantic subsidiary. CGP will employ 450 people (70 percent in engineering) and over 500 within three years, we were told. Its operations will center on four industrial poles already existing within CGE: automated systems (Alsthom-Atlantique); process control (CGEE [General Electrical Equipment Company]-Alsthom); computer-aided design (CIT-Alcatel); and components (CILAS [Laser Industrial Company], SCEMI [expansion unknown], ACB [Brittany Workshops and Construction Company] and Parvex). The company ambitions to cover 4 percent of the world market--estimated at over FF 100 billion--by 1987. It is headed by Mr Mercadal, chief executive officer of SOGELERG [expansion unknown]. With Renault and MATRA [Mechanics, Aviation and Traction Company], which created each a computer-integrated manufacturing pole, respectively Renault-Automation and MATRA-Automation, CGE is the third large French manufacturer in charge of automating production resources. [Text] [Paris ELECTRONIQUE INDUSTRIELLE in French 1 Nov 84 p 108] 9294

CSO: 3698/304

MICROELECTRONICS

FRENCH PROGRAM 'CORALIE' FOR GATE ARRAY CIRCUIT DESIGN

Paris ELECTRONIQUE INDUSTRIELLE in French 15 Nov 84 p 97

[Article: "Cassiopee and the National VLSI CAD Project"]

[Text] The Cassiopee computer-aided design [CAD] system developed at the CNET [National Center for Telecommunications Studies] was included in the national VLSI [very-large-scale integration] CAD project of the electronics sector to serve as a basis for an industrial system called Coralie.

Cassiopee is a CAD system already operational at the CNET, which is currently used to design circuits with a very high level of integration. It covers the logic (gates), electric (transistors) and geometric (masks) levels. It is used to describe and simulate circuits at these three levels and provides aids to go from one level to another while checking for consistency. It is structured around a specific database and integrates the symbolic design procedures of the CNET. It is well suited for customized circuits in NMOS or CMOS [N-channel or complementary metal-oxide semiconductor] technology.

The Coralie industrial system is a surassembly of Cassiopee and will also make it possible to design gate-array circuits using the MHS [Matra-Harris Semiconductors] standard as well as circuits assembled from standard cells. The database and the simulators, in particular the Eldo electric simulator will be those of Cassiopee.

The main stages of the Coralie project are:

- initial 18-month stage: conversion of Cassiopee software from the VMS operating system to the Unix system; commercialization of the Cassiopee database; feasibility study for an SM 90 work station using Cassiopee;

- second 18-month stage: commercialization of a series of integrated-circuit design software using the Cassiopee database; these could be used on SM 90 work stations.

The role of the industrial partners is as follows:

- the Apsis company is responsible for transposing Cassiopee under Unix; it is also in charge of marketing Cassiopee;

- Matra-Harris will implement the Cassiopee database in the context of "gate-array circuits and standard cells" and will develop software resources (creation of library cells, interactive implementation, aid to checking interconnections) to be integrated into the Cassiopee environment;

- Serge Dassault Electronics will be the hardware manufacturer in charge of evaluating the Cassiopee software; it will also act as a consultant and evaluate the SM 90 work station.

The CNET will provide software prototypes and their specifications. During the whole project, it will provide technical assistance to the other three partners.

This industrial transfer from the CNET will prepare the commercialization of the CVT (CAD VLSI for Telecommunications) system integrating the architectural level into Cassiopee and financed by the EEC.

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CSO: 3698/304

MICROELECTRONICS

FINNISH COMPANIES BEGIN MANUFACTURING SILICON WAFERS

Helsinki FORUM FOR EKONOMI OCH TEKNIK in Swedish 6 Feb 85 pp 18-19

/Article by Bjarne Nyman/

> /Text/ After 4 years of active research in cooperation with the Institute of Technology, Outokumpu Oy and Oy Nokia Ab have now agreed on the production of silicon wafers on an industrial scale. The silicon wafers will be used as the basic material for the processing of integrated microcircuits both in Finland and abroad. "We will direct export efforts mainly in Scandinavia and the rest of Europe," says General Manager Olavi Siltari of Outokumpu. Silicon wafers of the current type will not be manufactured on an industrial scale anymore in any of the Nordic countries.

Plans for the manufacturing of silicon wafers in Finland are old. As early as 11 years ago the idea began to be developed by Professor Veikko Lindroos at the Department of Metallurgy at the Institute of Technology. However, serious research began 4 years ago when Nokia and Outokumpu came into the picture. This occurred within the framework of a project which was partially financed by the Ministry of Trade and Industry.

Functioning Cooperation: University-industry

Over the course of the last 4 years a research group of almost 20 people has acquired technical production knowledge in the area on a laboratory scale. Silicon wafers of high quality have been manufactured and marketed on a test basis. The market response in combination with their own acknowledged and achieved quality, is one of the important factors which serves as a basis for Outokumpu's and Nokia's decision on fullscale production.

"The project is a very fine example of cooperation between industry and university," says General Manager Olavi Siltari. "Both are needed for a good result."

The silicon wafers will be manufactured within the framework of a company which does not yet exist. The proposed company does not even have a name yet, but it does have a managing director. Immo Seppanen, doctor of engineering,

currently managing director for Texas Instruments, has been named as the new company's managing director. The new company will be a subsidiary of Outokumpu, while Nokia will hold a minority portion of the shares.

Difficult Manufacturing

The manufacturing of the silicon wafers will occur according to the so-called Ozochralish Method with extremely clean silicon as the basic material. In the beginning of the production process, the silicon material is melted down into liquid form whereupon crystallization occurs based on a mother crystal which is placed in contact during the melting. The growing crystal is lifted slowly and the result is a silicon rod. The different types of semiconductors, n-type or p-type, then add small amounts of basic elements into the surface of the electron shell with alternatively three or five electrons.

The silicon crystal grows to the desired size in 10 to 24 hours, whereupon it is cut with a diamond saw into wafers which are about 0.5 mm thick. Grinding, polishing, chemical cleaning and vacuum packing then follows. The production is then ready for distribution to the customers.

It is obviously not so simple in practice. On the contrary, it is very difficult to get the silicon crystal to grow so that it is sufficient for the production of silicon wafers for semiconductor purposes. For example, the demand for cleanliness during the process is about 100 times greater than in the operating room at a hospital. However, this technique has hence now also been learned in Finland.

1 Million Wafers Per Year

For the time being, as far as is known the silicon wafers will only be used by one Finnish firm. The firm is Vaisala Oy which does not manufacture integrated circuits but does make other microelectronic products. Micronas Oy, which is mainly owned by Nokia with firms including Outokumpu as partowners, assembles IC-circuits adapted for customers but the manufacturing occurs in the United Stwaes by Micro Power Systems.

Manufacturing will be transferred to Finland when Micronas' new factory facilities are ready for usage in about 1 year. Then, Micronas will be a potential customer for Outokumpu's future subsidiary, and the largest user of silicon wafers in Finland at the same time.

Thenew factory will begin producing about 300,000 silicon wafers per year. In 1988 it is expected that production will be fully developed and capacity will then be about 1 million silicon wafers. This is obviously a lot of wafers, but it is still only about 0.5 percent of world production.

The total investment for the factory which will employ 70 people is about 70 million markkaa. Annual sales at fully developed capacity are expected to be about 100 million markkaa.

12562
CSO: 3698/295

SCIENTIFIC AND INDUSTRIAL POLICY

U.S. SUBSIDIARY TO PARTICIPATE IN 'ESPRIT' CIM PROJECT

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 14 Feb 85 p 1

[Article: "Partners in Information Technology Sought. Through Subsidiaries American Firms Also Participate in European 'Esprit' Project"]

[Text] (GL) Munich--Information technology firms in Europe are currently feeling each other out for possible contacts. The first phase of the European research project involving international cooperation in this field, 'Esprit' (European Strategic Program for the Research of Information Technology), is characterized by a search for partners and by the initial agreements not only between enterprises but also between the economy on the one hand and the advanced schools and research institutes on the other. There is little disagreement that much ground is still to be made up in Europe specifically.

Digital Equipment GmbH of Munich, the Italian Fiat subsidiary Comau of Turin and the French firm Renault Automation S.A. have now introduced a project for research and development in the field of CIM (computer integrated manufacturing). A total of $10 million, more than DM 32 million at today's exchange rate, is to be spent on this project during the next five years and one quarter of it will be provided by the EC's Esprit project. The rest will be provided by partners within the consortium which will be administered by Digital Equipment.

Some people may wonder why an American firm, Digital Equipment Corp of Massachusetts, is participating with financial support in this EC project. The Europeans at first wanted to prevent just such an action, Digital concedes. But it soon became clear that this was not possible, so now the only condition is that the companies participating in the project have their headquarters in Europe, in this case the German subsidiary of Digital in Munich. According to its German manager, Willi Kister, Digital Equipment is one of the first non-European firms to participate in the Esprit project.

Of course, many people are working on CIM. At Digital they also have no illusions of producing some kind of "revolution" in this area. In this field there is only evolution, says Kister, and the work involved will extend over many years. Although there is the problem that the individual facets of the business management process, such as product design, production planning and

production control increasingly develop into all too independent entities, to "islands" with a company, all parts of a company must still always work together and not independently toward a common goal.

To that extent these efforts parallel the concepts of "totality" frequently found in the more recent teachings of business management as opposed to a functional way of viewing things. The gaps existing between the individual areas can only be bridged with the aid of automation, says Digital. However, the enormous selection of computers and programs has made the task rather more difficult, this computer manufacture frankly admits. According to those in the participating firms, the need for integration, now being more earnestly pursued, will still increase substantially in all branches of the economy.

12552
CSO: 3698/280

SCIENTIFIC AND INDUSTRIAL POLICY

FRG'S FRAUNHOFER INSTITUTE REVIEWS ITS RESEARCH, FINANCING

Duesseldorf VDI NACHRICHTEN in German 16 Nov 84 p 6

[Article by E.K. Aschmoneit: "Between Science and Economics. Fraunhofer Institute Presents 1983 Financial Statement"]

[Text] The Fraunhofer Institute for the Promotion of Applied Research [FhG] held its 1984 annual conference in Stuttgart, the third time it has been held in this city and the sixth time in Baden Wuerttemberg during the institute's 35-year history. "The conference," Dr Max Syrbe, FhG president, told the assembled guests, "also pays homage to more than 30 years of cooperation" with the official agencies of this Land and to its minister president, Lothar Spaeth.

Fourteen of the 32 Fraunhofer Institutes located throughout eight of the FRG Laender are in Baden Wuerttemberg and 45.7 percent of all its employees, more than 3200 people including about 1000 scientists, work in this southwestern corner of the FRG. Syrbe adds another fact about this long-standing tradition: "The oldest Fraunhofer Institute was founded in 1954 in Mannheim."

In the year under review, 1983, the FhG financed projects worth DM 319 million as opposed to DM 289 million in 1982 (up 10.4 percent). This figure includes DM 45 million in investments in buildings and equipment for new institutes. Expenditures for research in progress amounted to DM 274 million divided among the contract research division in the civilian sector with DM 217 million (up 13 percent), related services at DM 12 million (up 9.1 percent) and defense-related research at DM 45 million (up 7.1 percent). Contract research still amounts to just under four-fifths of all FhG activities and covers 62 percent of its own expenses, meaning that the federal and Land governments must only provide 38 percent as a basic subsidy.

Each year the FhG receives from industrial enterprises and economic associations 700 to 800 research contracts which vary greatly in scope; of the total DM 45 million involved in the 498 contracts awarded between January and August 1984, for example, 2 percent involved sums of up to DM 10,000, 13 percent DM 10,000 to 50,000, 36 percent DM 50,000 to 250,000, 31 percent DM 250,000 to DM 1 million and 18 percent DM 1 to 5 million. In terms of the contract period, 27 percent were for 6 months, 61 percent for 7 to 12 months, 10 percent for 13 to 24 months and 2 percent for 25 to 36 months, providing an overall average of 10 months per contract. The largest contract at present is for DM 4.8

million and involves the development of new types of solar cells. The funds involved in developments for an instrumentation and information system for automotive production and for a control system for facilities for mixing the gases produced in steel works are not much smaller. As examples of medium-sized contracts Dr Syrbe gave the development of an economical assembly system for commercial scales, a diaphragm system for separating carbon dioxide and methane gas and an investigation into the vibration resistance of automobile exhaust systems.

Public institutions also awarded research contracts to the FhG amounting to DM 73 million between January and August 1984. These contracts for the most part involve longer-term projects which on the average extend over a period of 15 months and cost DM 420,000.

In order to adapt to changing requirements five institutes were closed or turned over to other organizations by the FhG in 1983, another three were converted to deal with areas compatible with contract research and nine economics-oriented institutes or working groups were newly founded: Production Systems and Design Technology in Berlin, Production Technology in Aachen, Labor Economics and Organization in Stuttgart, Technology Development in Stuttgart, Toxicology and Aerosol Research in Hanover, Solar Energy Systems in Freiburg, Transportation Technology and Commodity Distribution in Dortmund, Microstructure Technology in Berlin and Microelectronic Circuits in Duisburg.

The FhG senate decided to found an Institute for Laser Technology in Aachen whose construction is expected to cost about DM 30 million over the next five years and which will employ about 70 people. Lasers are considered a key area of technology with broad applications in communications and measurement technology, medicine and even in processing and improving the quality of materials. The significance of laser research is clear from the fact that the U.S. government in 1984 spent $1.3 billion on it, while Japan has spent $5.7 billion in seven years for applications in material processing and industrial production. "In Japan," notes Syrbe, "they are already saying that remaining competitive in production processes at an international level could depend on the utilization of laser technology." There are eight major research areas within the FhG:

- microelectronics and sensor technology
- information technology and production automation
- environmental research
- manufacturing technologies
- behavior of materials and structural components
- process engineering
- energy technology and structural engineering
- technical/economic studies, technical information

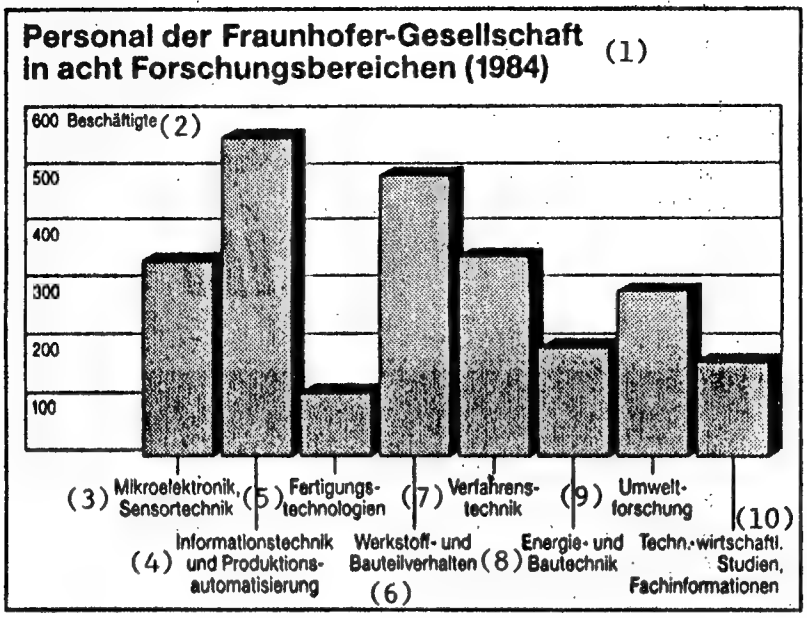


Fig. 1 The FhG Accepts 700 to 800 Research Contracts Annually from Industrial Firms and Economic Associations

Key:

1. FhG Personnel in Eight Research Fields (1984)
2. Employees
3. Microelectronics, sensor technology
4. Information technology and production automation
5. Manufacturing technologies
6. Behavior of materials and structural components
7. Process engineering
8. Energy technology and structural engineering
9. Environmental research
10. Technical/economic studies, technical information

The greatest number of FhG employees, about 550, work in the area of information technology and production automation, but with just under 300 people involved in four different institutes environmental research also carries great weight. The first three areas mentioned above are expected to expand the most. It is expected that during the next four years more than DM 70 million will be invested in the area of microelectronics, over DM 60 million in information technology and production automation and over DM 30 million in process engineering and environmental research.

In addition the FhG is involved in several "federal projects" concerning science and economics funded by the Ministry for Research. In five of the projects--submicron (electronic circuits with conductor widths of less than 1 micron), image and speech recognition, computer-aided design of technical hardware and software, integrated sensor optics, transparent thermal insulation in construction--the FhG took on the added burden of coordinating the work of all of the agencies involved.

And finally there is also talk of setting up "temporary" scientific working groups which would be affiliated with FhG Institutes, advanced schools or even business enterprises. They would be assigned research and development work to be completed within five to eight years. "With these fixed-time working groups," says Syrbe, "we want not least of all to offer our young up-and-coming scientists additional possibilities for obtaining post-graduate qualifications." Know-how thus achieved in technologies with great potential for the future could be an important link to later activities in industry.

The FhG not only accomplishes transfers of technology but also of people themselves. Each year about 30 to 40 scientists transfer to the economic sector. This sector also benefits from a large number of the 300 to 400 student helpers engaged in scientific work at the institutes who enter the economy following the completion of their education. In the past ten years about 40 former FhG scientists have founded production companies, consulting firms or engineering offices, creating nearly 250 jobs to date.

12552
CSO: 3698/300

SCIENTIFIC AND INDUSTRIAL POLICY

VENTURE CAPITAL MEETING OUTLINES CURRENT FRG SITUATION

Duesseldorf VDI NACHRICHTEN in German 16 Nov 84 p 7

[Article by E. Schmidt: "Funds in the Millions Assured: German Mentality Not Yet 'American' Enough. Prepare for Flops. Don't Label Unsuccessful As Failures."]

[Excerpts] The current state of venture capital financing in the FRG was the topic of the Second International Venture Capital Congress in Munich. A more "venture-oriented management" able to avoid the pitfalls inherent in founding a new company is needed in order to turn available capital into increased concrete investments. Nevertheless there will still be flops. But it is important not to label a person who has gambled much and been unsuccessful as a failure. Rather he should be given a chance to take advantage of the experience he has gained.

Potential company founders frequently have interesting technical ideas as well as concepts for developing products from them which have good market potential, but they lack knowledge of the hows and whys of founding a company. And above all they have no capital. How providers of capital--with good opportunities for profits of their own--might help them was the central theme of the Second International Venture Capital Congress in Munich.

Dr Peter Hellerich of IC Investment Congresse GmbH of Munich which sponsored the congress said at its opening that more than DM 750 million was currently available for venture capital financing in the FRG; this sum had been raised in the past few months but to date only about 5 to 10 percent had gone into concrete investment projects. One reason for this, he said, was the lack of qualified "venture-oriented management," i.e. people able to evaluate a proposed project and then guide it around all of the pitfalls inherent in founding a new company: Here there will certainly be a great future need for appropriate kinds of training.

Dr Klaus Nathusius of Cologne presented an interesting picture of the current venture capital situation in the FRG as a kind of introduction to the congress which would deal with all of the problems associated with this subject in great detail. Nathusius, one of the most well-known venture capital specialists, spoke of venture capital resources totaling only about DM 500 million but emphasized that not only were former tax-shelter investment consultants

behind many of these offers but also "a number of excellent names" in the world of German industry and finance. And if to date only a small portion of the available resources have been invested--in companies which required financing--there are more than enough resources available.

According to Nathusius there are more than 2 million companies in the FRG, and more than 200,000 new ones are added each year. Of those, perhaps one percent, or 2000, are "technology oriented" and another 2000 are also innovative if not necessarily involved in technology. This means that each year there are 4000 new potential customers for private venture capital, not to mention the already existing "requirement backlog" of the many small- and medium-sized businesses which unfortunately frequently operate very conservatively and thus "miss many opportunities." Nathusius asks, "Why aren't new ideas simply tried out (by the companies) more often on a small scale?"

For Nathusius, what is lacking on the venture capital scene in the FRG is no longer primarily the resources, as was the case a short time ago, but rather diversity and spontaneity: "The money is coming somewhat one-sidedly from industry and the banks; more private venture capital companies would be desirable." Big names, says Nathusius, "are too dominant; the venture capital scene is not yet diverse enough for my taste."

While Nathusius concerned himself with the German scene, Dr John Soden in a remarkably enlightening presentation dealt with current international venture capital trends and focused in particular on the U.S. Soden is from the New York company International Technology Ventures.

Soden is not entirely free of scepticism regarding the venture capital scene in the FRG. Much of the funding available today does probably not qualify as "serious" money, says this commuter between the old and new worlds: It exists at the moment because venture capital has become fashionable. "How will things look in five or ten years? And when people realize that there will also have to be failures in this business?" Soden: "It will be a real shock because people in the FRG have scarcely any experience with flops. At the same time it is clear however that the greatest opportunities are counterbalanced by equally great risks..."

Soden views not only the financing people with scepticism. Potential founders of companies in the FRG are also not entirely to his liking: "Founders frequently do not want to give up the security of their old jobs--but they absolutely must do so, otherwise it will never work." And he is rather sure that those who operate with a kind of "safety net" are probably the same people "who are also the underperformers", i.e. those doomed to failure.

Two statements by Soden ought to be written in gold in the personal logs of all those who would like to provide as well as those who would like to receive venture capital (and politicians too), i.e. his warning that one should "never" invest solely for the purpose of creating jobs. "A venture can only succeed when a new product offers society something new of value," i.e. if it has new market potential.

And the second? His second warning involves the way the FRG deals with people who have once taken that big step of founding a new company and come up short: "These people should not be labeled failures," but should be given credit for showing courage and initiative and should be recognized as now having experience which might make them very well suited for a new startup. However, in the FRG people are miles away from such an attitude, complains Soden.

12552
CSO: 3698/300

SCIENTIFIC AND INDUSTRIAL POLICY

MONEY, MANPOWER SPENT ON FRENCH R&D IN 1982 BY SECTOR

Paris INDUSTRIES ET TECHNIQUES in French 20 Nov 84 pp 19-22

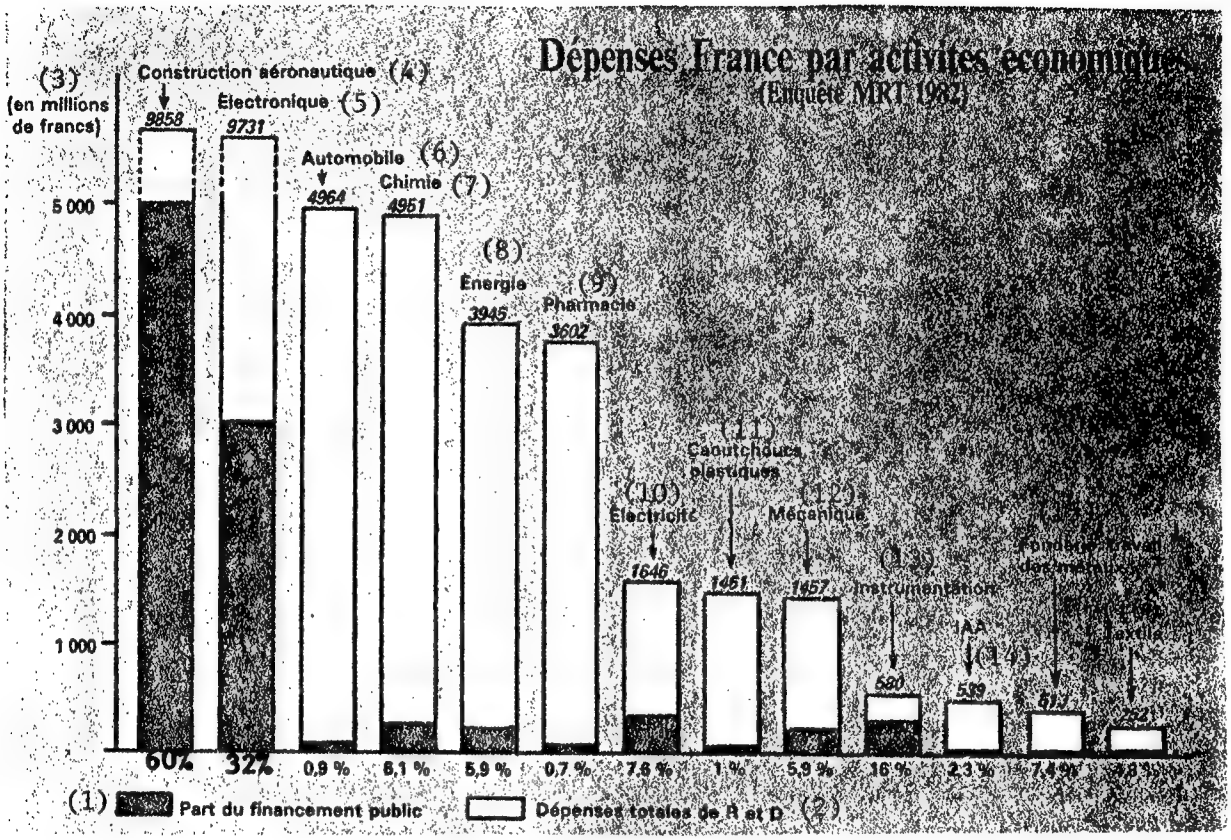
[Article by Catherine Vincent: "Yes, Business Is Accepting the Challenge"]

> [Text] Forty-three percent of R&D expenditures, 59 percent of the work completed: French firms are not trying as hard as their U.S., Japanese and German partners. But a reawakening has unquestionably been taking place since 1980. And the trend seems to accelerate.

Our R&D effort accounts for only 7 percent of the world expenditures (OECD countries). The two giants of technology, the United States and Japan, lead with respectively 48 percent and 18 percent, followed by the FRG (10 percent). The United Kingdom has only 6.5 percent, so that France ranks fourth among the industrial powers which total 90 percent of R&D expenditures.

In 1982, our effort amounted to FF 73 billion, i.e. 2.05 percent of the gross national product. That was an undeniable progress compared with 1981 (1.95 percent of the gross national product), and it reflects a rate of growth far above the rate of economic growth. Yet all major R&D countries are now devoting higher percentages of their gross national production to research, with record percentages in the United States (2.7 percent) and Germany (2.6 percent). France remains one of the countries whose industries invest the least in R&D: 43 percent of the total in 1982 (i.e. FF 31 billion), shared about equally by nationalized firms and the private sector. The State's majority contribution to R&D financing is in strong contrast with the situation in Japan and the FRG, both champions of private investment, where business is financing respectively 62 percent and 57 percent of the national R&D. We share with the United States the characteristic of a strong impetus through large nuclear and space programs financed by the government. But 50 percent of U.S. expenditures still come from the industrial sector.

We are also the country where the industry is doing the least R&D. Work done within firms accounted for FF 43 billion in 1982 (FF 12 billion, i.e. a little over one fourth of the expenditures, being thus provided by the government). That is 59 percent of the total, compared with 70 percent in the United States and Germany, 63 percent in Japan and 62 percent in the United Kingdom.



French Expenditures Per Economic Sector (1982 Survey of the Ministry of Research and Technology)

Aeronautical engineering and electronics account for one third of all expenditures. Note the effort made in the automobile and chemical sectors, which is mostly financed by the firms themselves.

Key:

1. Public financing
2. Total R&D expenditures
3. (In millions of francs)
4. Aeronautical engineering
5. Electronics
6. Automobile
7. Chemical industry
8. Energy
9. Pharmaceutical industry
10. Electricity
11. Rubber and plastics
12. Mechanical engineering
13. Instruments
14. Agricultural and food industries
15. Foundries, metalworking
16. Textile industry

This relative weakness of our industrial sector, however, appears to be slightly improving. A relative decline in public financing has been quite evident since the beginning of the 1980's. This year, the industry's share would amount to 45 percent, compared with 43 percent in 1982. The same trend can also be observed in all other countries, with the exception of the United States. In 1981 and 1982, the share of public financing in the United States increased faster than the share of business itself, essentially due to the programs implemented by the Department of Defense.

To the increasing investment of the French industrial sector is added the part of the State budget which is devoted to R&D in firms. Of the FF 42 billion allocated by the government in 1982, 12 were earmarked for firms and 30 for public research organizations. In 1984, out of a total of FF 46 billion, firms received about FF 16 billion (i.e. a relative increase of 6.2 percent) in the form of implementation funds and technological contracts. On the other hand, the State budget not earmarked for industry remains stable around FF 30 billion. These funds are essentially allocated to large programs carried out in public research organizations. Indeed, general funding for universities accounts for only a minute part of public R&D financing, contrary to what is the case in Japan and Germany, where they amount respectively to half and one third of the State budget. Close to three fourths of the funds allocated to our public technological research come from the civilian budget, and the last fourth from the Ministry of Defense. Forty-two percent of the civilian budget transits through the Ministry of Research and Technology (Ministry of Industry and Research in 1982), and they are distributed essentially among the CEA [Atomic Energy Commission] (2 billion), the AFME [French Energy Management Agency] (300 million), the CNRS [National Center for Scientific Research] and the INRA [National Institute for Agronomic Research] (2.5 billion). The Ministry of Post and Telecommunications, the main public relay of electronics research, accounts for over 30 percent of the civilian budget, which are nearly equally shared between the CNES [National Center for Space Studies] and the electronics sector. With about 10 percent of the civilian budget, the Ministry of Transport finances essentially the civilian aeronautical program. Sponsored by these three ministries and the Ministry of Defense, public organizations and technical centers are thus carrying out close to one third of the country's R&D. As far as technological development contracts are concerned, the CEA and the CNES are carrying out respectively most of the electronuclear and space programs, while the CNRS, the AFME and the INRA are sharing mobilization programs (biotechnologies, energy) among themselves.

Yet, technical centers, which devote only 10 percent of their activities to R&D proper, represent the main relay between basic and applied research. Essentially oriented toward the improvement of traditional technologies (materials, product quality and production processes), the largest among them are also giving increasing attention to "national priorities," energy savings, implementation of materials, pollution control. In 1983, the total resources of technical centers amounted to about FF 2 billion, half going to the French Petroleum Institute, FF 190 million to the Technical Center of the Mechanical Industries, and FF 150 million to the French Iron and Steel Research Institute. This budget is funded by parafiscal taxes, contributions and contracts with outside firms; and 5 percent by public financing. Of the whole 1982 public budget earmarked for budget, the Ministry of Defense distributed FF 8.2 bil-

R&D Per Company Size (1982 Survey of the Ministry of Research and Technology)

As in Japan and the FRG, small or medium-size firms and industries account for a sizable proportion of R&D.

	Number of Employees					
Data	< 500	500-1,000	1,000-2,000	2,000-5,000	> 5,000	Total
Number of firms	698	255	156	132	81	1,322
Percent of total	52.8	19.3	11.8	10	[illeg.]	
No. of researchers	5,115	3,681	2,957	6,536	19,077	37,366
Percent of total	13.7	9.9	7.9	17.5	51	
Company R&D expenditures (million francs)	4,484	3,400	2,990	7,585	24,891	40,350
Percent of total	10.3	7.8	6.9	17.5	57.5	
Public financing (million francs)	499	351	370	1,338	8,025	10,583
Percent of total	4.7	3.3	3.5	12.6	75.9	

Aids from ANVAR [National Agency for the Implementation of Research]

The largest progression is for the mechanical industries, which stand out as do electronics and the parachemical industries.

	1982		1983		
Number of applications granted	1,388		1,494		
Total amounts approved (million francs)	629		826		
Sector	Expenditures (million francs)	% of Total	Expenditures (million francs)	% of Total	Progression
Mechanical industries	79.4	12.6	61.7	7.5	+ 5.1%
Transportation	51.5	8.2	56.4	6.8	- 1.4%
Pharmaceutical	32.5	5.2	51.1	6.2	+ 1%
Electrotechnics	10.8	1.7	44.2	5.4	+ 3.7%
Data processing	23.4	3.7	39.7	4.8	+ 1.1%
Biomedical	21.2	3.4	38	4.6	+ 1.2%
Agrifood	22.8	3.6	36.9	4.5	+ 0.8%
Electronics	20	3.2	36.6	4.4	+ 1.2%
Parachemical	4.9	0.8	35.3	4.3	+ 3.5%
Control and measurement	36	5.7	35	4.2	- 1.5%

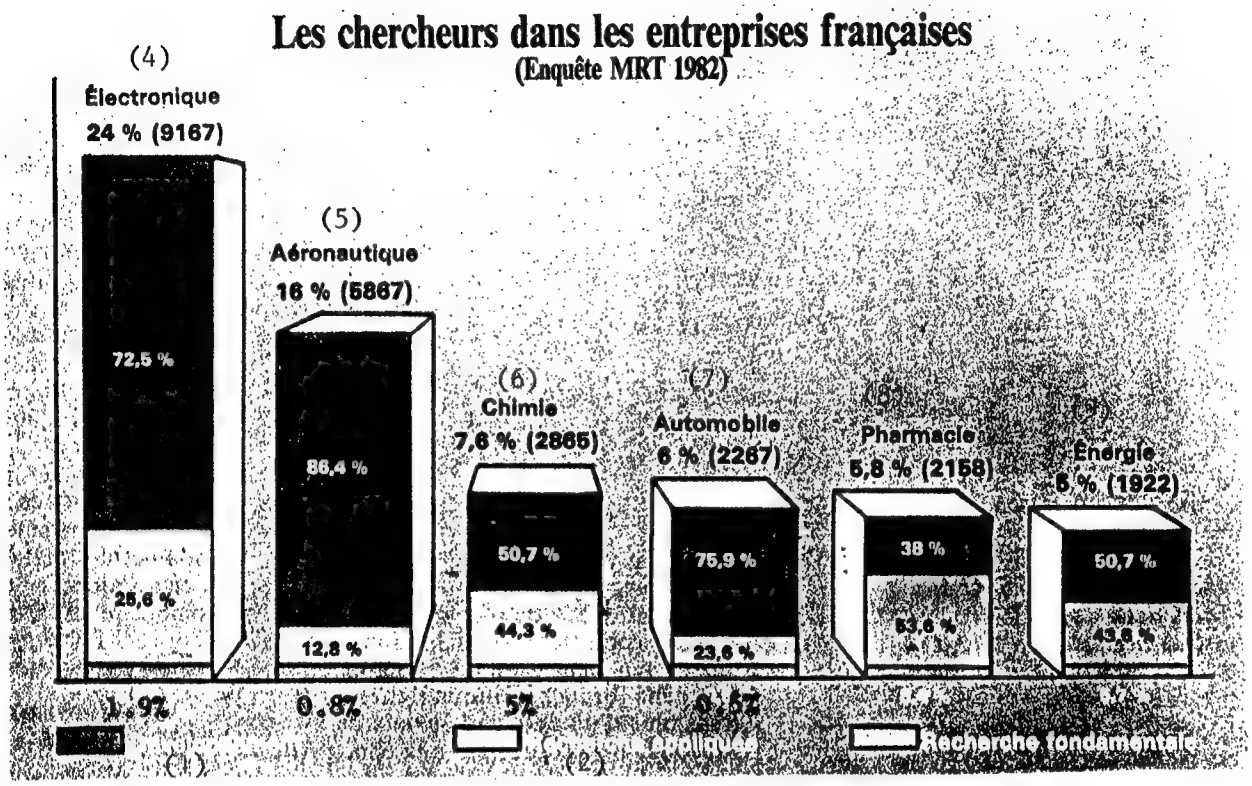
(Source: ANVAR)

lion, 25 percent of which to the electronics sector and 69 percent to aeronautical engineering. A little over FF 1 billion came from the Ministry of Post and Telecommunications (including 85 percent for the electronics sector). The contribution of the Ministry of Industry and Research (FF 1.1 billion) was obviously better balanced, but aeronautical engineering still received 16 percent of it and the electronics sector 15 percent, following closely the energy sector (20 percent). As in the United States and in the United Kingdom, where defense and civilian aeronautics also account for most large transfers from the state to the industry, the distribution of public credits therefore focuses on two industrial sectors. Aeronautical engineering (56 percent) and electronics (29 percent). Therefore, it is no wonder that the State contribution to the R&D effort is very uneven, depending on the industrial sector. Thus, it reaches 60 percent in aeronautical engineering and 32 percent in the electronics sector, but drops to 2.3 percent in the agricultural and food industries, 0.9 percent in the automobile industry and 0.7 percent in the pharmaceutical industry.

Considering this imbalance, the funding provided by the industry for its own R&D in 1982 is evidence of the considerable effort made by business: FF 31 billion, corresponding to a rate of growth, in terms of the gross national product, of 9 percent over the previous year. This effort is due essentially to large nationalized groups (in which over half of the French industrial R&D potential is concentrated). The French industry thus finances close to three fourths (72 percent) of its own research, which still leaves it far behind Japan and the FRG (98 percent and 81 percent), but ahead of the United States (68 percent) and the United Kingdom (66 percent).

According to the Ministry of Research and Technology, 1,322 firms were doing R&D on a permanent basis in 1982. These are also the largest firms, since they account for 40 percent of all industrial jobs and 50 percent of the country's production. Of the 130,000 people concerned (in full-time equivalent), close to 37,500 were research engineers, i.e. 6.5 percent more than in 1981.

Taking into account the State's contribution, the electronics and aeronautical sectors together account for over one third of all R&D. In 1982, the figures were 20 percent for aeronautical engineering and 19 percent for electronics. Among the other industrial sectors, automobile manufacturing totalled 11 percent of expenditures, the chemical industry 9 percent, the energy sector 7 percent and the pharmaceutical industry 6.3 percent. Thus, six sectors alone, representing one third of the overall industrial added value, accounted for three fourths of the R&D effort. The completed nature of their work is very marked, since 56 percent of expenditures are devoted to development, 40 percent to applied research and 4 percent to basic research. This concentration in a few sectors is also found in the United States and in the United Kingdom. The only notable difference with the other two R&D leaders is the proportion devoted to aeronautical engineering (which is nearly inexistent in Japan and restricted to 6 percent in Germany). Apart from this difference, the same overall observations apply to the five great powers. About 90 percent of all their industrial R&D is done by two major types of industries. The "mechanical" industries (about 70 percent of all R&D) which include the manufacture



Researchers in French Companies (1982 Survey of the Ministry of Research and Technology)

About 100 firms or so only are employing 73 percent of all full-time "researchers."

Key:

1. Development [top section of bars]
2. Applied research [middle section]
3. Basic research [bottom section]
4. Electronics
5. Aeronautics
6. Chemical industry
7. Automobile
8. Pharmaceutical industry
9. Energy

of metallic products, machines and equipment, transportation and aeronautical engineering. And the "chemical" industries, accounting for about 20 percent of the total (oil products, including rubber and plastic products).

In addition, there is a concentration in a relatively small number of firms. In France, only about 100 firms, among those doing R&D on a permanent basis, are employing over 50 full-time researchers. They also account for three fourths of the French R&D potential, with 73 percent of researchers, 77 percent of industrial expenditures and 94 percent of public financing; and 51 percent of research engineers are working in firms having over 5,000 employees, whereas small or medium-size industries with less than 500 employees (i.e. over half of all firms) account for only 13.7 percent. This proportion is still higher than that for firms with 500 to 1,000 employees (10 percent) or 1,000 to 12,000 employees (8 percent), which shows the part played by small or medium-size industries and firms in innovation processes.

In the United States and in the United Kingdom, hardly 5 percent of all R&D is done in firms with less than 1,000 employees. The situation in France is halfway between that of these giants of concentration and that of Japan and Germany. In the latter two countries, small and medium-size firms also account for 20 to 25 percent of industrial research expenditures. But their actual contribution to R&D is larger than that of French small or medium-size industries and firms, thanks to numerous industrial associations which enable them to work as subcontractors without financing of their own.

Technological Research: The State Makes a Gesture

Credits of the Research and Technology Fund (FRT) allocated to firms were nearly doubled in 1984. After regulation, they amount to close to FF 500 million, i.e. over half of the overall FRT credits. The budget of aids to innovation (National Agency for the Implementation of Research) was FF 900 million. And the research tax credit, which enables firms to deduct 25 percent of their R&D expenditures from their profits, represented FF 750 million during the first year of its application. That is, disregarding the instalment effect, a credit of approximately FF 380 million. The first results available seem to prove that this system, which was designed primarily to help small firms, is bearing fruit. Of the 1,350 firms concerned, 60 percent of the beneficiaries employed less than 500 people.

In addition to these tax incentives, the number of CIFRE (Industrial Conventions for Training through Research) was doubled to 360. To encourage coupling between research and industry, four multiannual programs were also created, associating public organizations, engineering schools, firms and technical centers. The themes adopted are: fabrication of new materials, surface treatments, welding and bonding methods and industrial laser technology.

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CSO: 3698/303

SCIENTIFIC AND INDUSTRIAL POLICY

FRENCH SOURCES, TYPES OF FINANCING FOR HIGH-TECH INNOVATION

Paris INDUSTRIES ET TECHNIQUES in French 20 Nov 84 pp 60-61

[Article: "Financing: 19 Doors"]

> [Text] Loans, subsidies, repayable advances, equity capital contributions... judging by the arsenal of the banks and administration, there are at least 19 ways of financing innovation. But you must know at which door to knock.

A large number of financial procedures--aids, subsidies, repayable advances, loans--and fiscal procedures have been implemented in recent years to encourage firms to invest in research, innovation, technological progress and the development of new products.

The National Agency for the Implementation of Research (ANVAR) is the hub of this system. Since it was renovated in 1979, considerable resources were placed at its disposal in the form of aids and innovation subsidies. Innovation subsidies were abolished at the end of 1983. But most of the operations for which it was designed are now supported by other means: in particular by tax credits.

In 1984, emphasis was placed on improving the linkage of research and industry as well as the training of research engineers. As far as aids are concerned, greater incentives were provided in the treatment of expenditures corresponding to the priorities of the government policy, especially by making it possible to depreciate research expenditures incurred during the year and by improving the tax treatment of the creation and use of data-processing software and the hiring of researchers by small or medium-size firms.

Tax Credit For Increased Research Expenditures

Beneficiaries: industrial and commercial firms: new firms under certain conditions (sales of less than FF 30 million and less than 150 employees during the year of creation).

Coverage: activities having the nature of fundamental or applied research, or experimental development operations (final research stage). Period covered: 1983 to 1987.

Form and amount: the tax credit is equal to 25 percent of the additional research expenditures incurred during one year compared with the previous year. It cannot exceed FF 3 million per firm and per year.

Basis: depreciation allocation for fixed assets assigned to research; expenditures for personnel assigned to research; operating expenditures; expenditures related to external research; patent application and maintenance costs.

Aid to Innovation

Objective: to aid innovation programs from the design stage to prototype production.

Beneficiaries: any firm developing a new product or manufacturing process.

Conditions: the project must have considerable economic interest and the firm must have an adequate technical and financial capacity.

Form: signature of a convention with ANVAR, outlining the obligations incurred by the aid recipient.

Advance to be repaid in case of success, usually limited to 50 percent of the total cost of the program consisting of design, patent, investment and personnel costs. Repayment is determined by the sales resulting from the recipient program.

Special Aid to Innovation to Create a Firm

Beneficiaries: any natural or artificial person creating a firm in order to implement an innovation (service companies excepted).

Form: a subsidy paid by ANVAR in two instalments. It is limited to 50 percent of the estimate submitted by the creator and cannot exceed FF 150,000.

Aid to the Industrial and Commercial Launching of an Innovation

Beneficiaries: small or medium-size firms which have already successfully developed an innovation program with the aid of ANVAR, and which must now launch it on the market.

Form: advance paid by ANVAR in two instalments and repayable in case of success. It is limited to 50 percent of the estimate submitted by the firm. It cannot exceed FF 250,000 per operation.

Loans to Participate in an Innovation, and Medium-Term Credit

Objective: aid to the industrial and commercial launching of innovative products from the prototype stage.

Beneficiaries: firms that must cover innovation-related needs (financing of innovative products, adaptation of production structures).

Form: credit or medium or long-term (2 to 15 years) participation loan. Amount limited to 70 percent of all expenditures, inclusive of all taxes. The cash flow is provided by banks. The risk of failure insured by CEPME [expansion unknown] with the assistance of INODEV [expansion unknown], a mutual guarantee company specialized in innovation.

Basis: the overall financial needs of the program: industrial launching, commercial launching, working capital requirements.

Loans From the Industrial Modernization Fund (FIM)

Beneficiaries: industrial firms or firms in the tertiary industrial sector, and equipment leasing companies (industrial equipment).

Conditions: installation of high-technology machines and equipment.

Form: technological participation loans which can be assimilated to equity capital for which the borrower does not have to provide a guarantee.

Rate: 9.75 percent in 1984. Length: up to 10 years, with a 2-year redemption grace period. They can reach up to 70 percent of the amount of the investment programs submitted. Management: the FIM is managed by ANVAR.

National Guarantee Fund (SOFARIS [expansion unknown])

Objective: to relieve lending institutions through mutual insurance of part of the financial risks involved in giving credit to small or medium-size firms.

Form: guarantee provided by Sofaris to enable credit institutions to grant medium and long-term loans to small or medium-size firms.

Equity Capital Contributions of Innovation Funding Companies

Aid takes the form of an equity capital contribution to firms through the acquisition of minority and temporary interests in their stock, through current-account contributions from partners, through subscription to issues of convertible bonds.

Innovation funding companies: Soffinnova, Batinnova, Epicea, Innovelf, Idianova, Electronova, Finovelec, Finovectron, Agrinova, Innovest, Suddinova.

Exceptional Depreciation of Durable Goods

Coverage: plant and equipment to be used for scientific and technical research operations.

Form: the exceptional depreciation is computed by multiplying the amount of the first annual degressive depreciation of the durable goods, as determined before the time-prorated reduction, by a rate which varies according to the normal useful life of the goods: 40 percent for durable goods with a normal useful life of 9 years or less; 42 percent for goods with a normal useful life exceeding 10 years [as published]. The rate of 42 percent is then increased by 4 points per normal year of use of the goods in excess of 10 years.

"Market Survey-Innovation" Insurance

Beneficiaries: firms having received an aid to innovation and looking for markets abroad.

Form: COFACE [French Foreign Trade Insurance Company]-ANVAR guarantee covering up to 70 percent of the survey, during one year.

Training

Special tax provisions came into force in 1984 concerning "researchers' training and employment contracts" in firms with less than 2,000 employes, subject to certain conditions (unemployed researchers with at least 3 years of experience).

The Arsenal of Aids

Name	Nature	Partner
Tax credit for increased research expenditures	Tax preference	Departmental Directorate of the Tax Administration
Aid to innovation	Repayable advance	ANVAR
Special aid to innovation to create a firm	Subsidy	ANVAR
Aid to the industrial and commercial launching of an innovation	Repayable advance	ANVAR
Participation loans	Loans amounting to equity capital contributions	CIDISE, CEPME [expansions unknown], General Treasury

The Arsenal of Aids (continued)

Name	Nature	Partner
Loans from the Industrial Modernization Fund (FIM)	Loans amounting to equity capital contributions	ANVAR
National Guarantee Fund (SOFARIS)	Fund for the mutual insurance of risks	Financial institutions, banks
Special "innovation industrialization" loans	Low-interest loans	National Credit Bank, CEPME, SDR [Regional Development Co.], CCCC [Central Cooperative Credit Fund]
Special "computer-integrated manufacturing equipment effectiveness" loans	Low-interest loans	National Credit Bank, CEPME, SDR, CCCC
"Medium-term innovation" credit	Loans	INODEV [expansion unknown], Equipment Credit Bank for Small and Medium-Size Firms
Equity capital contributions from innovation funding companies	Equity capital contributions	Innovation funding companies
Industrial policy credits from the Ministry of Research and Industry	Subsidies, repayable advances	Regional Directorate of Research and Industry
Equity capital contributions and other aid from the SDRs	Equity capital contributions, long-term loans	SDR
Equity capital interventions from the IDI [Industrial Development Institute]	Equity capital contributions	IDI
"Market survey-innovation" insurance	Guarantee	COFACE, ANVAR
Exceptional depreciation of durable goods	Tax preference	Departmental Directorate of the Tax Administration

The Arsenal of Aids (end)

Name	Nature	Partner
"Researchers' employment and training" contracts	Tax preference	Departmental Directorate of Labor and Employment - Regional Directorate of Research and Industry
Contracts for industrial training through research (CIFRE)	Subsidy	ANRT [National Association for Technical Research]
Regional Agencies for Scientific and Technical Information [ARIST]	Technical assistance	ARIST

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CSO: 3698/303

SCIENTIFIC AND INDUSTRIAL POLICY

COFACE CHANGES RISK-GUARANTEE GUIDELINES AT FIMTM'S REQUEST

Paris INDUSTRIES MECANIQUES in French 29 Nov 84 p 26

[Article: "COFACE [French Foreign-Trade Insurance Company]: Insurance Against Economic Risk"]

[Text] An improvement in the insurance against economic risk was just adopted following repeated requests to the administration by FIMTM [Federation of Mechanical and Metal-Processing Industries]. A dual measure was taken by the Ministry of Economy, Finance and Budget:

Reduction of the Deductible Rate

The three rates are now assessed as follows:

- contracts with cash payment or foreign-currency financing: the rate is reduced from 5.5 to 4.5 percent according to a decision to be made in each specific case by the guarantee commission, based on foreign competition;

- protocol-financed contracts receiving subsidies from the Directorate of the Treasury: rate reduced from 9.5 to 8.5 percent;

- other contracts: rates reduced from 7.5 to 6.5 percent.

New Regulations For Contracts Exceeding FF 75 Million

Their object is to achieve greater overall standardization of procedures. Under these new regulations, applications will be processed in roughly five stages:

- the firm shall file a provisional statement (in a manner close to the AP6 procedure) within 6 months after the contract has come into force;

- a provisional settlement shall take place immediately after the export shipment, at the initiative of the firm;

- a final statement that will generate payment of the final indemnities shall be made by the firm within 12 months following the coming into force of the contract. Only 85 percent of the indemnities will be paid at that time;

- the remaining 15 percent will be paid 12 months after the final indemnity, unless the file goes through control, in which case the 15 percent will be retained until the control is completed;

- controls will be less frequent and there will be changes: the elements of computation (per item of expenditure) will be standardized. The control mission will check only the foreign portion, the accuracy of the dates and the distribution of purchases into "firm price" and "price subject to revision" categories.

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CSO: 3698/311

SCIENTIFIC AND INDUSTRIAL POLICY

FRANCE'S RPR CALLS ELECTRONICS PLAN 'BIG FAILURE'

Paris AFP SCIENCES in French 6 Dec 84 p 35

[Article: "The 'Big Failure' of the Electronics Plan, According to the RPR"]

[Text] Paris--The electronics plan, "presented by the socialists as one of the major stakes of this presidency, will be one of its major failures," Mr Michel Noir, general secretary of the RPR Rally for the Republic , stated on 5 December, as he presented a "dossier telling the truth" on this sector. The results of the plan, in his opinion, are "strongly negative, for the government is engaging in large-scale manipulation of the figures," concerning public financing, foreign trade and job creation.

The very idea of planned sector "proved a failure, for France cannot do everything on its own," the official stated, and he declared himself in favor of defining priorities in certain subsectors: telecommunications, components, peripherals and software. "Scattering our efforts amounts to sprinkling public moneys at the expense of efficiency," Mr Noir added.

In 1986, assuming the opposition wins the elections, denationalization "will be completed in a few days, taking an example on the sale of British Telecom shares in Great-Britain," the national secretary indicated. This operation would involve all groups in the sector (Bull, Thomson, General Electricity Company, General Telephone Engineering Company) and even MATRA [Mechanics, Aviation and Traction Company] which has the benefit of a special plan (the State is only a majority shareholder, along with private shareholders).

According to the RPR, the concept of planned sector produced a "veritable industrial Tinker-Toy set," as is shown by the French-French regrouping of the General Electricity Company and Thomson, Bull's "force assembly," the failure of the Thomson-Grundig-Philips agreement, the "sale without any actual counterpart" of the French interest in Olivetti.

In the field of components, "hesitations have put Thomson two years behind and cost it its independence," Mr Noir estimated. If a financial effort had been made already in 1982, Thomson "would not have been forced to accept the agreement with IBM and its counterparts (entry of the U.S. group into universities, public research centers, the National Education system)."

As far as employment is concerned, "the illusion was short-lived, as 3,500 jobs in the electronics sector were abolished already in 1983, whereas the government had expected the creation of 80,000 jobs over 5 years," Mr Noir stated.

This dossier was presented one week after the assessment made by the Council of Ministers. The latter emphasized that a "jump" had taken place at production level (+ 8 percent per year) and in the trade balance, but acknowledged that results were not as brilliant as far as job creation and financing were concerned.

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CSO: 3698/312

SCIENTIFIC AND INDUSTRIAL POLICY

NEW VENTURE CAPITAL COMPANY ESTABLISHED IN MUNICH

Duesseldorf HANDELSBLATT in German 21 Jan 85 p 6

[Article: "Venture Capital/New Holding Company Founded in Munich; Banks and Insurers Provide Capital for Innovative Enterprises"]

[Text] Munich. Under the sponsorship of the Bavarian State Institute for Organization Financing (LfA), Munich, 10 Bavarian banks and 2 Bavarian insurance companies have established the Bavarian Venture Capital Holding Company, Inc, Munich/Gruenwald.

It has at its disposal over 18 million DM of net worth (of which 9 million DM is common capital stock) and is incorporated as a profit-making company. It is the goal of the Bavarian Venture Capital Holding Company, primarily founded at the initiative of the Bavarian Economics Minister Anton Jaumann, to participate in small business enterprises in Bavaria with the aim of supporting development and marketing especially of new technologies and with the aim of restructuring within certain growth areas. This was emphasized by its chairman of the board, LfA vice president Udo Walter. The activities of this company will concentrate exclusively upon enterprises resident in Bavaria and its business manager will be Dr Wilhelm Zirngibl who is at the present withdrawing from his office of ministerial director for reasons of age.

"This is not going to be just another pork barrel of subsidies--tax monies are not the issue," emphasized Bavaria's minister of economics Anton Jaumann who sees in the Bavarian venture financing company above all an instrument of his own small business policies. Jaumann observes moreover that proprietorship capital weakness is usually the greatest obstacle to the financing of investments having good future prospects but beset by risk.

Besides, he observes that in view of the quite numerous venture capital groups already existing in the FRG there has been a danger that a quasi-"oligopoly" of a few big venture companies would not always pay suitable attention to Bavarian interests and that moreover write-off sharks hungry for booty could still be bustling about in the area of venture financing. Finally, he asserted, Bavaria has by now developed into a semiconductor center of European stature. Therefore Bavaria's great attraction as an industrial site ought to be further rounded off by a white-and-blue [i.e., "Bavarian"] offer of venture capital.

Thus the State of Bavaria is not from the outset involved in the Bavarian Venture Capital Holding Company. And security against possible losses is not being provided by guaranties. If the 18 million DM investment should turn out to be too little there would be a capital increase or a special fund would be formed. Participants in the 9 million DM original capitalization of the Bavarian Venture Capital Holding Company, Inc, are: the LfA with 2.5 million DM, the Bavarian State Bank with 1.5 million DM, the Bavarian Hypo Bank and the Bavarian Vereinsbank with 1 million DM each, the Bavarian Raiffeisen Central Bank, the Bavarian People's Banks AG and the Bavarian Insurance Union as well as the Bavarian Insurance Company with 500,000 DM each and finally the four private banks Merck, Finck and Company; Bankhaus Reuschel and Company; Bankhaus Karl Schmidt, Hof; and the Prince Thurn und Taxis Bank with 250,000 DM each.

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CSO: 3698/292

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NEW VENTURE CAPITAL COMPANY ESTABLISHED IN BERLIN

Duesseldorf HANDELSBLATT in German 23 Jan 85 p 1

[Text] Berlin. A new venture capital company, the "New Europe Hitec + Biotec Company for Innovation mbH + Co KG," was founded in Berlin on 18 January. According to a press release the "New Europe" will in its initial stages be capitalized with 75 million DM and will primarily sponsor innovative enterprises in high technology and biotechnology in Berlin and in the rest of the FRG as well as in other parts of Europe. The business management is in the hands of Henry M. Giudice, the former chairman of the board of Martin Brinkmann Company, Bremen, and business managing chairman of the Brinkmann Holding Company in Berlin.

The new Berlin venture capital company aims at newly establishing or participating in already established enterprises active in the area of key technologies having future potential. The member companies of this new organization are industrial firms, banks and one insurance company. Nevertheless, the company circle has not yet been finally closed and thus it is still possible for additional interested organizations "compatible with the goals of the company" to participate in the "New Europe."

Up to now the membership has included Allianz Insurance AG, the Berliner Bank AG, the Robert Bosch GmbH, the Huels Chemical Works AG, the Commerzbank AG, the Daimler-Benz AG, the Deutsche Babcock AG, the Deutsche Bank AG, the Dresdner Bank AG, the Henkel KGaA, the Herlitz AG, the Hoechst AG, the Koerber Group (Hauni Works), the Linde AG, the Nixdorf Computer AG as well as Rupert Group Holdings. The chairman of the board of governors is Heinz Nixdorf (Nixdorf Computer AG, Paderborn) who together with the two deputy chairmen Juergen Sarrazin (Dresdner Bank AG, Frankfurt/Main) and Dr Hans-Otto Wieschermann (Henkel KGaA, Duesseldorf) constitute the presidium. In the past Berlin has already been together with Munich and Frankfurt a focal point of the German venture capital scene.

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CSO: 3698/292

SCIENTIFIC AND INDUSTRIAL POLICY

RESEARCH MINISTER ON FRG TECHNOLOGICAL STRENGTHS, DIRECTIONS

Duesseldorf WIRTSCHAFTSWOCHE in German 8 Feb 85 pp 36, 38

[Interview with Heinz Riesenhuber, FRG research minister, by WIRTSCHAFTSWOCHE editors, Manfred Hasenbeck and Wolf-Dieter Michaeli: "Dispelling Antagonism"; date and place not specified]

> [Text] Heinz Riesenhuber, FRG minister of research and technology, feels well equipped for a game of catch-up with the Americans and Japanese in the area of new technologies. In an interview with WIRTSCHAFTSWOCHE he indicated the strengths of the West Germans.

WIRTSCHAFTSWOCHE: Mr Minister, the West Germans still lag behind the Japanese and Americans in the field of new information and communication technologies despite enormous efforts on the part of your ministry. The gap even threatens to widen.

Riesenhuber: The Japanese and Americans do in fact have a certain head start in the development and marketing of new technologies, but it is obviously dwindling. In 1982 we were about three years behind in terms of chip development. In the meantime we have moved to only about two years behind and by 1989 we could pull even with the Japanese in the development of 4 megabit chips.

WIRTSCHAFTSWOCHE: Future business, however, lies more in office technology, production automation and telecommunications.

Riesenhuber: You must certainly not forget another very important area for us. In our market which is characterized by small and medium-sized businesses we have had great success integrating electronics into mechanical engineering. These are areas where we have traditionally been strong. In this case modern electronics are built into an existing product accounting for perhaps only two to three percent of its total cost but helping to give the company a strong international competitive advantage. Here again the development of microprocessors plays a decisive role.

WIRTSCHAFTSWOCHE: Does this mean that the race to produce the best chip will be the central point of your research policy?

Riesenhuber: Not that alone--I chose this spectacular example because it so clearly illustrates how the Japanese have been able to realize a technical advantage in the marketplace. Another area, namely systems organization, is just as important. This will begin with the construction of a West German research network which will make the overall scientific information system clearer and accessible to all.

WIRTSCHAFTSWOCHE: Then the magic formula for allowing the Germans to catch up is this: greatly intensified chip development and improved know-how transfer.

Riesenhuber: The development of new technologies is taking place at a galloping pace. If it is possible to compete at the top internationally in one basic technology--particularly in chips in this case--then all other steps are also more easily taken and managed. When we have achieved parity in chip production we will on that basis also become competitive in all other technologies. Each new level we achieve will lead us to a certain extent into other areas. If we are not able to also utilize this basic technology for other areas of industry, we run the risk that others will beat us to it.

WIRTSCHAFTSWOCHE: Compared to the powerful financial portfolios of the Japanese and Americans, will BMFT (Federal Ministry for Research and Technology) funds even be sufficient to allow us to compete internationally?

Riesenhuber: What we spend cannot be compared to that which via the Pentagon budget in the U.S., for example, goes into the research and development of new technologies. Many billions are spent--as direct funding for that matter. In Japan, on the other hand, it is possible for the postal service to conduct research in the field of information technology and microelectronics at a cost of over a billion marks. In contrast, the funds available to our own postal service are extremely small.

WIRTSCHAFTSWOCHE: Does the postal ministry then not yet realize that the ability to compete in the fields of information and communication technology will in the future be a decisive factor in terms of growth in whole sectors of the economy of the FRG?

Riesenhuber: Regardless of the fact that I would like to see the postal service invest somewhat more in research, we must develop various different strategies based on the particular situation in our nation. The huge requirements of the U.S. defense budget, for example, are something we cannot and do not want to support.

WIRTSCHAFTSWOCHE: Why not?

Riesenhuber: There are numerous reasons, from NATO integration to the sheer magnitude of the figures. But even state control in this area such as is provided by Japan's MITI would only be productive for our national structure to a limited degree and in some important areas even counterproductive. Our industrial strengths lie in small and medium-sized businesses as the example of the machine construction industry shows. This area still leads German exports and to a great extent involves small and medium-sized businesses. If

we attempted state control in this area it would be at the expense of an extremely productive, flexible system. The traditional strength of our small and medium-sized firms is that they go to the marketplace with tailor-made products and can adapt quickly to changes in demand.

WIRTSCHAFTSWOCHE: You are talking about conventional markets in this connection. However, with new technologies a small or medium-sized firm scarcely has a chance to compete successfully in international markets.

Riesenhuber: Information and communication technologies are in fact not typically the concerns of small or medium-sized businesses. There are plenty of German companies with good products, but the market is controlled by large-sized suppliers. But here too the outlook is good and our current position in world markets is quite strong. However, I would like to emphasize again that it is important for our small to medium-sized industries to integrate microelectronics into mechanical products--not to develop purely microelectronic products.

WIRTSCHAFTSWOCHE: This idea does not seem to have found broad acceptance as yet. The Japanese and Americans, on the other hand, have reacted more quickly in this area than the Germans.

Riesenhuber: You are describing the situation in 1982. If microelectronics is still misunderstood today, it is for historical reasons. For years discussions of new technologies brought up negative images, from that of the job killer to the disintegration of the family. And in the first half of 1982 the government did not yet have a clearly recognizable position. This also contributed to the confusion in industry.

WIRTSCHAFTSWOCHE: Has a rethinking process taken place in this regard in the meantime? Is everyone--the state, the scientific community and industry--pulling together now?

Riesenhuber: For many businesses it was difficult in the past to approach the scientific community, and researchers in addition had no great desire to cooperate. German professors were accused long enough of prostituting themselves if they conducted research under contract to industry. Such a climate did not exactly serve to enthuse our scientists. Over a period of years the general antipathy toward technology also served to dampen enthusiasm for trying new things. People's attitudes toward new technologies have changed in the meantime, especially in small and medium-sized businesses.

WIRTSCHAFTSWOCHE: Reticence on the part of small and medium-sized business was, however, also a result of a lack of information. Frequently smaller firms first hit on new developments when the Japanese and Americans were already putting finished products on the market.

Riesenhuber: Right. But the gap can only be bridged if there are reasonable discussions among the associations, industry, the scientific community and naturally our colleagues in the other ministries.

WIRTSCHAFTSWOCHE: Wouldn't it also make sense in addition to these discussions to combine the activities of the BMFT, postal service and the ministry for economics, which at times go galloping off in different directions, into one super ministry under, let's say, a super minister Riesenhuber?

Riesenhuber: The idea is certainly fascinating but carries with it enormous problems. Where would the lines of demarcation be if you wanted to integrate the whole postal service into the BMFT? I am not particularly enthused about this idea. In principle the whole thing is in the final analysis just a matter of good management and coordination. I believe that the way we are currently handling things is really not bad.

WIRTSCHAFTSWOCHE: So you are fundamentally opposed to a super ministry in the manner of Japan's MITI?

Riesenhuber: MITI should not be viewed as the be all and end all. This institution certainly has at its disposal some very sensible functions, instruments and strategies, some of which we can reasonably take over and others which we cannot. Moreover, a German MITI would cause more problems in the transition phase than it would ultimately solve. The transfer of information at a high level only functions when it does not take the science-state-industry detour. Rather, the state must create the framework for cooperation between science and the economy, and this can be expressed in joint ventures between large-scale research facilities and businesses or in technology parks.

WIRTSCHAFTSWOCHE: The example of technology parks is already beginning to take on a negative connotation in industry. Nearly every community in the meantime boasts its own high-tech center and is doing its own personal thing. Should the BMFT not at least act to coordinate this sector?

Riesenhuber: The final judgment as to the efficiency of the technology parks cannot yet be made. These institutions are still too new and enough information is not yet available. I do not rule out that some of them will prove to be ill conceived, but that is entirely normal. Research which does not allow flops or take them into account is basically no research at all but simply reproducing the state of the art. Nevertheless I am convinced that it is possible, following a certain initial phase, to integrate and coordinate knowhow in the technology parks in a sensible way.

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CSO: 3698/281

SCIENTIFIC AND INDUSTRIAL POLICY

VENTURE CAPITAL ATTITUDES, PRACTICES IN FRG

Duesseldorf WIRTSCHAFTSWOCHE in German 8 Feb 85 pp 136, 137, 139

[Article: "Venture Capital: Boom in Berlin"]

[Text] In the past few years in Berlin venture capital financing companies have sprung up out of the ground like mushrooms. Now an additional DM 75 million fund has been added, financed by some prime names.

The list is long, noble and not yet complete. The Deutsche Bank is naturally included, Nixdorf is not lacking, and Henkel and Hoechst have also already joined the list. This group of partners is still wide open for other interested parties, above all for companies whose aims "coincide with those of the company", according to the announcement of its formation. The Neu-Europa Hitec + Biotec Gesellschaft fuer Innovationen mbH & Co. KG from its location on the Spree River (Berlin) is engaged in venture capital activities all over Europe: It is funding--yet again--companies involved in high technology and biotechnology. That Berlin has become a collecting basin for venture capital --Berlin's coffers are said to contain between DM 200 and 300 million--is no accident according to Joachim Simmross of the Wirtschaftspartner Beteiligungsgesellschaft mbH (WBB). "The market here is much more concentrated than elsewhere," is how he explains the involvement in Berlin of this company in which the industrial firms SEL and Nixdorf are also involved.

The Kapitalbeteiligungsgesellschaft mbH (KBG), a wholly-owned subsidiary of the West Berlin Sparkasse (Savings Bank), appears to be having the greatest success in this market. Even if it does not quite meet the image of venture financing in the American mold, the KBG cannot complain about a lack of interest. Founded in 1983, its investments totaled DM 5 million one year later and then increased by an additional DM 5 million.

In the meantime the company has taken part in seven joint ventures amounting to between DM 100,000 and DM 2 million each, primarily in the areas of microelectronics, software and medical computers.

The most successful joint venture for KBG to date however has been the Aquata sports and leisure wear company founded in 1977 which now has over 100 employees, lists sales in the tens of millions and is currently comtemplating a joint venture with a Japanese company.

Founders' Mecca

Information on Venture Capital Companies in Berlin

Name	Address	Person(s) in charge	Major areas of investment	Investments (in millions of DM)/ focus of local funding	Partners	Founding
BIH-Innovations- und Handels-gesellschaft mbH	Uhlandstr. 179/180 1000 Berlin 12	Helmut Rausch	Information technologies	Supra-regional distribution of investments	Helmut Rausch	1982
WFG Deutsche Gesellschaft fuer Wagnis-kapital mbH, Berlin branch	Budapester Strasse 40 1000 Berlin 30	Robert Schneider	Small & medium-sized businesses, EDP, measurement & controls, recycling, energy technology, medical technology, chemical technology	130/supra-regional	Deutsche Bank (30%), Dresdner Bank (22%), Commerzbank (18%) FRG Landesbank (18%), Bavarian Landesbank (12%)	Nov 1984*
GKB-Beteiligungs-gesellschaft mbH	Nuernberger Str. 68/69 1000 Berlin 30	Gerhardt Wolff	Companies in existing or planned founders' centers	Supra-regional distribution of investments	Grundkreditbank	Sep 1984
Innovation fund of the Berlin Senator for Economics	Martin-Luther Str. 105 1000 Berlin 62	Rainer Durand	none	1984: ca. 15, anticipated for 1985: 10, anticipated for 1986: 10	The Land Berlin	Sep 1982
KBG Kapital-beteiligungs-gesellschaft mbH Berlin	Schlosstrasse 36, 1000 Berlin 41	Walter Hasenmueller	none, small and medium-sized businesses	10/Berlin	Savings Bank of the city of West Berlin (Spar-kasse)	Nov 1983

Name	Address	Person(s) in charge	Major areas of investment	Investments (in millions of DM)/ focus of local funding	Partners	Found-ing
Risikokapital-Beteiligungs-gesellschaft der Deutschen Versicherungs-wirtschaft AG (KDV)	Kurfuersten-damm 24, 1000 Berlin 15	Malte von Bargen, Juergen Mees, Johannes Puhl	none, small and medium-sized businesses	100/supra-regional	Founding share-holders: Aachen and Munich Life Insurance Cos., General Annuity Credit Institu-tion, Colonia Insurance, Conti-nental Medical Insurance, Signal Medical Insurance	Aug 1984
TIG Techno-logie-Investi-tions GmbH & Co. KG	Kurfuersten-damm 209, 1000 Berlin 15	Heinz Uebelhack	EDP, CAD/CAM, production and measurement tech-nology, biotech-nology, chemo-technology, media technology, materials, etc.	20/supra-regional	Bank fuer Handel & Industrie, BMW, Bavarian Vereinsbank, Dresdner Bank	Dec 1984
TVM Techno Venture Management Gesellschaft mbH & Co. KG, Berlin branch	Ackerstrasse 71-76, 1000 Berlin 65	Werner Weber	Process controls, biotechnology, EDP, energy tech-nology, communi-cations, medical technology, test-ing, measurement and controls	116/supra-regional	Matuschka Group, Munich; TA As-sociates, Boston; Advent Group, London; Siemens, Munich	Oct 1983

Name	Address	Person(s) in charge	Major areas of investment	Investments (in millions of DM)/ focus of local funding	Partners	Founding
VC Gesellschaft fuer Innovation mbH Berlin	Kurfuerstendamm 209, 1000 Berlin 15	Dietmar Gruener	none, small and medium-sized businesses	10/Berlin	Berlin Industriebank, Industriekreditbank, Deutsche Industriebank, Deutsche Bank Berlin	Oct 1983
Wirtschaftspartner Beteiligungsgesellschaft mbH (WBB), Berlin	Kurfuerstendamm 93, 1000 Berlin 31	Joachim Simmross	Industry, trade, service sector	10 + 20 credit ceiling/Berlin	Berlin Commerzbank, Berliner Bank, Nixdorf, SEL, Hannover Finanz GmbH	April 1984
Neu-Europa Hitec + Biotec Gesellschaft fuer Innovationen mbH & Co. KG	Kurfuerstendamm 182/183 1000 Berlin 15	Henry M. Giudice	Investment in existing or newly founded companies in key technologies	75/supra-regional	Founding companies: Allianz, Bosch, Daimler-Benz, Henkel, Hoechst, etc.	

* Its predecessor, Deutsche Wagnisfinanzierungs-Gesellschaft, Berlin branch, was founded in June 1975

The KBG financing people always follow the same pattern in their dealings. With their investment partners they contract to limit profit sharing to 12 percent in addition to the fixed interest of as a rule 6 percent, so that in an optimum situation the annual return on the investment would be 18 percent.

There is at least no lack of money, all the experts agree: The KBG managers also know how to avoid the pitfalls of all financing structures.

In fact involvement by someone like ex-Nixdorf manager Helmut Rausch and his BIH-Innovations- und Handelsgesellschaft mbH is still the exception rather than the rule. Rausch, the lead investor with his own private capital, is also involved in the company's management. Only when the company has stabilized will he accept additional investors.

The intensive involvement then is also the reason that venture capital investors are leery of really new companies. "Start-up financing--that is the high art of the venture capital business," frankly admits Dietmar Gruener of the VC Gesellschaft fuer Innovation mbH. For his company which had invested DM 3.2 million of its DM 10 million investment fund by the end of last year, he sees a greater chance of achieving a reasonable "changing of the guard" in established companies. When one considers what "the national economy has lost in terms of structure" as a result of the large number of insolvencies of the past few years, says Gruener, suppliers of venture capital can no longer exclusively consider new companies. As a successful example of his conviction he points to Tonindustrie Prueftechnik GmbH, a company which tests building materials. Founded in 1876 as a family business, it was sold to the Korff group in 1973, survived its reorganization proceedings and again survived the collapse of Wibau which had taken it over. Today Prueftechnik again has sales of about DM 20 million.

Most providers of venture capital do not have just high technology in mind in their involvements. Even Deutsche Wagnisfinanzierungs-Gesellschaft mbH (WFG), which has maintained an office in Berlin since 1980 and since that time has made 15 investments totaling about DM 12 million, has shown itself to be more open since its restructuring in the fall of last year when it comes to joint ventures. According to Robert Schneider of the WFG, the ideal partner company "need only be a properly managed company with high growth potential."

Werner Weber of TVM Techno Venture Management GmbH & Co. KG is also singing the same tune. The customers he likes best are those "who really don't need money"--in other words firms which have been in business for two or three years already and want to finance rapid growth with investment money.

For newcomers among businesses, therefore, the most important address appears to be that of the Senator for Economics on Martin-Luther-Strasse in the Schoeneberg district. That is the location of the administrative offices of the innovation fund of the Berlin Senate, and many believe that this public funding establishment was the initiator of the venture capital boom in this city. With this fund 30 firms, including 22 newly founded companies, had been financially "lifted up by their bootstraps" by the end of 1984.

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CSO: 3698/281

SCIENTIFIC AND INDUSTRIAL POLICY

BRIEFS

ITALIAN RESEARCH MINISTRY GROWS--Rome--On December 18, the Italian Council of Ministers approved a bill authorizing the scientific research minister, Mr Luigi Granelli, to recruit on a private contractual basis ten highly specialized experts in the scientific and technological research field to meet his administration's growing need for qualified personnel. Mr Granelli is authorized to hire on an "emergency" basis. The text of the law recognizes that this is a compromise measure until a complete revamping of the ministry's administration can be effected. The Audit Office had already authorized the Ministry of Scientific Research, last November, to increase the number of its experts from the current level of 134 to 233, and the number of its managers from one to six. Observers point out that the new bill, which must receive Parliament's endorsement before becoming effective, will reinforce this personnel with ten new experts. [Text] [Paris AFP SCIENCES in French 20 Dec 84 p 15] 9825

TECHNICAL EDUCATION IN FRANCE--Nearly 2 million students are involved in technical education. There are currently (1983-84 figures) 1,730,000 at the secondary level (65 percent second cycle students) distributed among 2,333 institutions. There are 881,000 students enrolled in technical long cycles in general and technical high schools, 631,000 students working toward a CAP (certificate of professional competence) or a BEP (professional education certificate) in vocational high schools, and 218,000 young people enrolled in apprenticeship centers. These institutions awarded (1982 figures) 462,234 diplomas, 259,723 CAP's, 94,474 BEP's, 12,215 professional certificates, 6,022 technician certificates, 21,389 advanced technician certificates (BTS) and 68,411 2-year college technical degrees. In higher education, 231,326 students are enrolled in technical programs: 60,000 in university technical institutes (IUT), 22,438 in national engineering schools and 148,885 in university science programs. [Text] [Paris AFP SCIENCES in French 22 Nov 84 p 3] 9825

FRENCH COMPUTER EDUCATION INSTITUTE-Rennes--Mr Jean-Louis Malgrange, project director in the higher education and research administration of the Ministry of Education, announced the opening of the Rennes Communications and Computer Education Institute (IFSIC) for the 1985-86 university academic year. During a press conference in Rennes, he indicated that the institute will enroll about 1,000 students (one-third beginning students and two-thirds continuing students). Two hundred will graduate

each year with advanced training (Baccalaureat plus 5, or, 7 years post-secondary education). Until now, only the Nice IFSIC was in operation; there is another being set up in Nancy. The Rennes institute will require an investment of 14 million francs and is part of Bretagne's state-regional plan. Mr Malgrange also announced that a Joint Western Micro-electric Center (CCMO) would be established shortly, linked with the Rennes Upper-Bretagne University and specializing in electronic components. [Text] [Paris AFP SCIENCES in French 20 Dec 84 p 18] 9825

FRANCE-JAPAN DATABASE COOPERATION--A cooperation agreement was signed between the French Scientific and Technical Documentation Center (CDST) of the CNRS [National Center for Scientific Research] and its Japanese counterpart, the JICST [Japanese Information Center for Science and Technology]. The agreement provides that the two countries will promote each other's specialized literature through their documentation centers. A joint working program concerning various areas of scientific and technical information will be implemented. Free circulation and free access to the IST [expansion unknown] will be guaranteed. [Text] [Paris LE NOUVEL AUTOMATISME in French Nov-Dec 84 p 45] 9294

CSO: 3698/310

TECHNOLOGY TRANSFER

COMMENTARY ON INDUSTRIAL ESPIONAGE ISSUES IN FRG

Duesseldorf WIRTSCHAFTSWOCHE in German 18 Jan 85 pp 36-38, 40, 42, 46-48

[Text] The increasing espionage activities of Eastern intelligence services and Western competitors annually cost billions to German industry. Growing pressure forces the security experts to slow down the illegal outflow of know-how.

People and atmosphere in the office on the third floor of Nymphenburgerstrasse 147 look terribly professional. Paper and record mountains are piled up on the desks, the ashtrays flow over. Staff members hectically rush to the telephones which ring almost incessantly and drink their coffee--just as if this were Scotland Yard here--from old thermos bottles. Hans-Joachim Lange, former policeman and business manager of the BVSW (Bavarian Association for Security in Industry, registered association) points to the shredder next to his armchair and provides the first security lesson. The contents of waste baskets, he says, are a virtually ideal source of information for industrial spies or their helpers. "Such weak spots," chain smoker Lange says, "can actually be eliminated by every boss by means of such a destroyer of records."

Lange's helper, Herbert Ebner, who calls his profession "technical author," apparently only trusts himself, now feels that the hour has come for people of his ilk. "The other side," he reveals, "has a permanent need to catch up, excellent procurement specialists and in future will steal even much more know-how than in the past."

Ebner also knows already where. In a 32-page study, entitled "Key Areas for Siphoning off our Know-how by the MfS (Ministry for State Security)," the security expert describes the future espionage targets of the East Berlin MfS: from "new and more effective methods of producing fuels" through "any new development and technology" in the field of microelectronics and computer design up to models of organization development, e.g., "processes for better utilization of shifts" or concepts for "more efficient organization of transportation processes." Lange has no doubt that the need of numerous FRG enterprises for such service and consultation efforts of security associations will greatly grow in the future. "Actually I am very thankful for the Rotsch case," the BVSW manager says, "such cases see to it that the problem is recognized in its entire scope."

For almost two decades, the 60-year-old academically trained engineer Manfred Rotsch was employed not only by the Munich Messerschmitt-Boelkow-Blohm GmbH (MBB). The actual employer of the industrial spy, exposed last September by the Cologne Federal Office for the Protection of the Constitution, was the Soviet intelligence service KGB. Four to five times a year, the top agent met with his Soviet case officer in Austria and turned over technical details of the NATO "Tornado" multipurpose combat aircraft. Meanwhile experts assess as of course much more explosive the probable betrayal of more recent research and experimental projects with latest technology: radar reconnaissance, electronic attitude stabilization up to details of a European combat aircraft for the 90's. All the things that Rotsch spied out and betrayed as department manager for "External Structural Loads (LKE 284)" will keep the injured parties busy for a long time. Embarrassingly enough, MBB apparently also was the only German enterprise to which the defense ministry gave strong financial support in the fulfillment of the security needs.

The discussion on security questions in German industry and the defense against industrial espionage since then at any rate has erupted with full force. And in Bonn the buck is passed from one to the other. The ZS ("maintenance of secrecy in industry") desk subordinated to the economics ministry has come under fire in this connection. That is the maintenance of secrecy system practiced in the FRG, which is based on the NATO document C-M (55)15, according to which all alliance partners have obligated themselves to protect classified material that comes within their domestic jurisdiction. In the individual procurement orders the public contracting agencies lay down the secrecy requirements applying to the order involved. The public contracting agencies cover the spectrum from the Bundeswehr to the postal authorities, or the federal ministry of the interior (police, border guards) up to the research ministry and the German Federal Bank. The suppliers obligate themselves to institute the required conditions through their security commissioners and to subject themselves to the control by the ZS desk of the economics ministry. Of course in the majority of the cases the ministry limits itself to written controls as to personnel data. The Federal Office for the Protection of the Constitution in Cologne joins in only in cases of the very top security clearances. Why a man such as Rotsch was able to slip through the meshes of this network meanwhile has become more evident. The attacked economics ministry defends itself by saying that MBB had listed the function of Rotsch in the reclearance processing merely as an "engineer." And Heribert Hellenbroich, the president of the Federal Office for the Protection of the Constitution, points to the sins of the past where Gerhard Baum, the former federal minister of the interior, had complained about the large number of reclearances in the industrial field.

In the opinion of the CDU/CSU defense expert Willy Wimmer, "failure of the government agencies", but also understaffing were the causes for the fact "that in the field of industry, according to the present state of affairs, more than 20,000 security reclearances were not performed."

The big question is of course who will make up these omissions in the future. For ideas are being circulated even now on how to redistribute the competences for the protection of secrecy in industry. Mentioned are the Ministry of the Interior and the Federal Office for the Protection of the Constitution

Table 1: Progress with Illegal Copies

Computers Produced in the East Bloc Countries	Their Western Models
C-256 (Romania)	*IRIS-50/80 (France)
IMG-810 (Hungary)	*IRIS-50 (France)
IMG-830 (Hungary)	*IRIS-80 (France)
TELSA-200 (Czechoslovakia)	*Bull-GE Gamma 140 (France)
ODRA-1300 (Poland)	*ICL-Software (Great Britain)
ES-1010 (Hungary)	*Mitra 15 (France)
ES-1020 (USSR and Bulgaria)	** IBM S/360 (USA)
ES-1030 (USSR)	** IBM S/360 (USA)
ES-1040 (GDR)	** IBM S/360-50 (USA)
ES-1050 (USSR)	** IBM S/360 (USA)
ROBOTRON 300 series(GDR)	** IBM 1401 (USA)
ROBOTRON R-21 (GDR)	** IBM 360 (USA)
ES-1025 (Czechosolakia)	** IBM S/370-125 (USA)
ES-1035 (USSR and Bulgaria)	** IBM S/370-135 (USA)
ES-1065 (USSR)	** IBM 3033 (USA)
ES-1055 (GDR)	** IBM S/370-158 (USA)
SM4-20 (Czechoslovakia)	** PDP-11 of DEC (USA)
SAM-80-Minicomputer (Hungary)	*** INTEL 8080-A (USA)
EMU-11 Small Computer (Hungary)	*** INTEL-Series 3000 (USA)
FELLAS-Systems (Romania)	*** INTEL-8080, Signetics 2650 (USA)
INTELDIGIT PI (Poland)	*** Chip: INTEL 8080-A (USA)
MERA-2500 (Poland)	*** Chip: INTEL 8080 (USA)
MEREX-100 (Poland)	*** Keyboard by Honeywell (USA) Matrix line printer by Logabax (USA) Chips by INTEL and TI (USA)

Source: Tuck, Heyne Verlag

* = manufactured under license from. . .
** = copy of . . .
*** = components of . . .

subordinated to it as well as perhaps the Military Counterintelligence Service (MAD). Conclusion of a protector of secrets in the economics ministry: "Practically there is only the possibility to assign the task of 'maintaining secrecy in industry' to the public contracting agency involved or centralized to the federal minister of the interior, whereby the latter would have to create a separate organizational unit which would be established outside the Federal Office for the Protection of the Constitution."

For Wimmer it is close to high noon. The industrial enterprises, he warns, "are turning off the tap on themselves if they permit that from the most sensitive fields of research which have not yet become state secrets, the things get over there by the bags full." There was hardly any shortage of spectacular cases in the past which could have woken up the tired security consciousness in Bonn and in the country as a whole:

--As early as 1968, a GDR computer spy was sentenced to two years' imprisonment in the FRG area. Gerhard Prager arrived in the West in 1959 as an alleged refugee from Stadtroda in Thuringia after he had graduated from basic computer training in the GDR. After several intermediate stations in the data processing industry, he landed in 1965 as a specialist for data enhancement installations with IBM in Sindelfingen. The EDP installation had stored on magnetic tape data on production and planning as well as the personnel of 3000 firms. Prager secretly copied these data during overtime and delivered them to East Berlin.

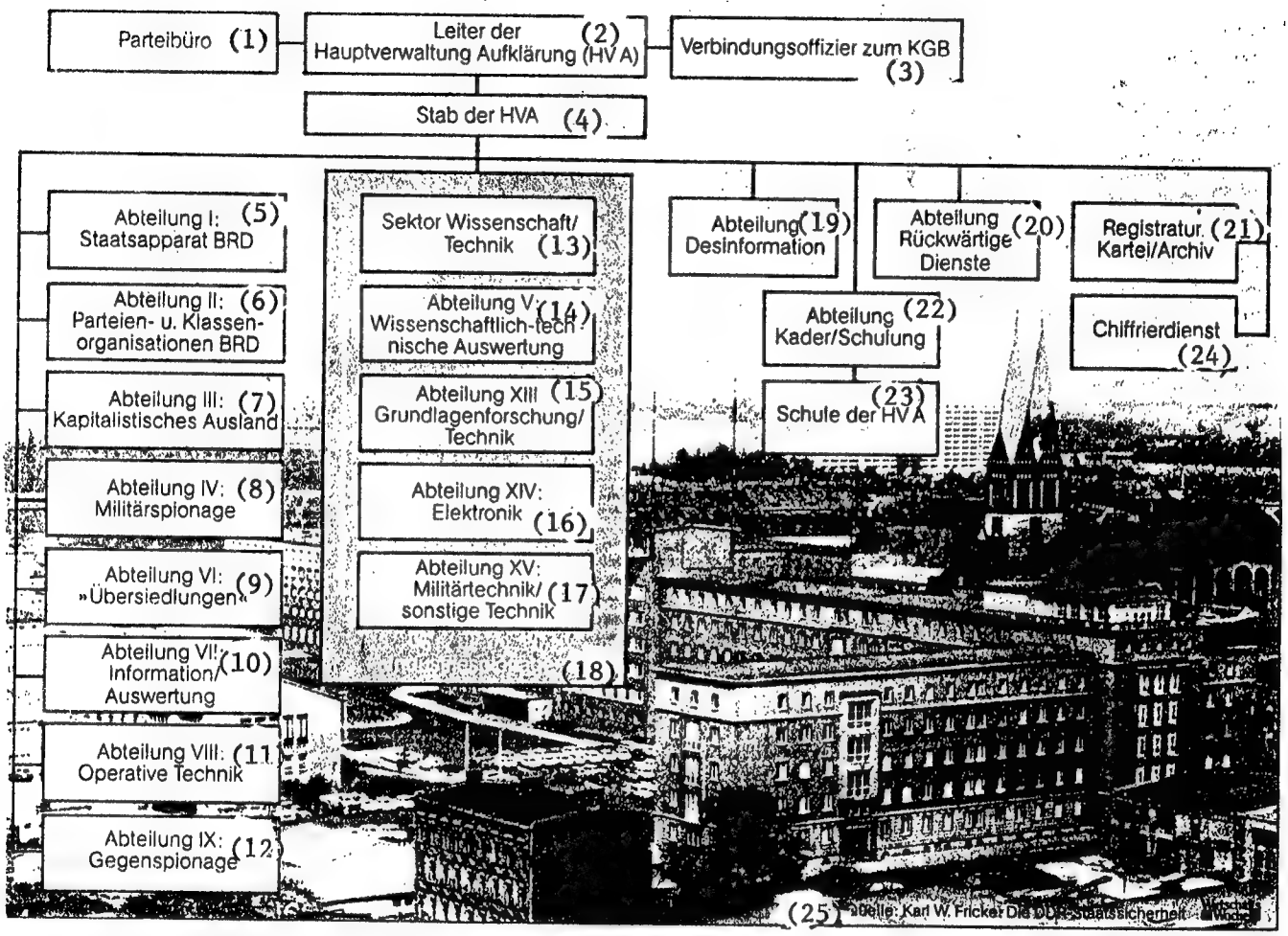
--For 6 years the engineer Juergen Reichwald with the MTU Motoren- und Turbinen-Union Muenchen GmbH betrayed all documents accessible to him on design, test runs, test flights, and delivery terms of the Tornado power plant to Eastern intelligence services--until he could be put on trial in 1982. According to testimony by witnesses, the spy had it easy even in a firm engaged in the armament sector. Reichwald was able to borrow documents completely without any worry, make copies and smuggle the plans out of the plant past the factory security.

--The MfS spy and cost accountant Reiner Paul Fuelle for 15 years provided highly important information and documents of the former Gesellschaft fuer Kernforschung mbH (Nuclear Research Limited Liability Company) and of the GWK (Gesellschaft fuer Wiederaufbereitung von Kernbrennstoffen--Company for Reprocessing of Nuclear Fuels) to the GDR and in return received at least DM 132,000. Fuelle was busted when the MfS first lieutenant and defector Werner Stiller spilled the beans in the FRG in 1979. However, Fuelle was able to take his amateur myrmidons for a ride. When the latter skidded on an icy road, he fled to the GDR but returned voluntarily to the FRG in 1981 and last spring was sentenced to 6 years in prison.

Especially Stiller's detailed knowledge and his statements on strategy and finer points of his former superiors should have put counterintelligence specialists and potential victims in the FRG on guard. As early as the beginning of the 70's it became apparent that the direction of Eastern espionage activities would move more and more to the fields of industry, science and technology. At that time four departments in the "HVA" were combined into a "Science and Technology

Industrial Espionage as Key Target

Organizational Chart of the HVA (Main Administration for Intelligence Collection) of the MfS



Key:

1. Party bureau
2. HVA director
3. Liaison officer to the KGB

4. HVA staff
5. Department I: FRG state apparatus
6. Department II: FRG party and class organizations
7. Department III: Capitalist foreign countries
8. Department IV: Military espionage
9. Department VI: "Emigration"
10. Department VII: Information/analysis
11. Department VIII: Operational technology
12. Department IX: Counterespionage
13. Science/technology sector
14. Department V: Scientific-technical analysis
15. Department XIII: Basic research/technology
16. Department XIV: Electronics
17. Department XV: Military technology/other technology
18. Industrial espionage
19. Disinformation department
20. Rear services department
21. Records office, files, archives
22. Cadre/training department
23. HVA school
24. Cryptographic service
25. Source: Karl W. Fricke "Die DDR Staatssicherheit"

Sector (SWT) (see chart). Three departments are concerned with the procurement of scientific-technical findings and of technical equipment. A further department analyzes the results and passes them on to research centers and industrial enterprises of the GDR.

"Such a concentration of effort," the Federal Office for the Protection of the Constitution noted in its INFORMATIONEN FUER DIE WIRTSCHAFT, thus far has not been observed even in the field of political and military espionage.

The SWT offices are no longer staffed with the apparatchiks and military of the olden days but with highly qualified technicians, engineers and scientists who see to rapid application of the findings that have been obtained. And the entire system functions in a highly capitalist manner. The recipients or contracting agencies pay for the obtained information with about 10 percent of the costs which otherwise they would have had to invest for research. With an annual budget of merely 5 million DM (West), Stiller calculated, about 300 million M (East) flowed into the MfS cash registers.

This is at the same time a yardstick of the damage inflicted on the spying targets in the FRG and which, in the opinion of Herbert Gassert, chairman of the board of the Brown, Boverie & Cie., is probably in the one billion neighborhood.

There is hardly any doubt within the ranks of the security experts that the illegal espionage and procurement actions will be massively increased in the future. The reason: The Paris Coordinating Committee for East-West Trade (COCOM), to which all NATO states--except for Iceland and Spain--and Japan belong, under heavy U.S. pressure increasingly restricts the possibilities for legal technology transfer from West to East. It is true, COCOM is supposed to prevent in the first place the outflow of militarily relevant technologies. But that is a matter of interpretation. One person knowledgeable of the scene says: "After all it is also possible to control missiles with a chess computer."

Thus the embargo list,which was completely revised and tightened up during the past year, now also includes products such as efficient personal computers, computer software and computer-controlled telecommunications systems, such as telephone exchanges.

Thus far of course, the U.S. broadcasting reporter Jay Tuck (Jay Tuck: "The Computer Spies. The Secret Trade With NATO technology," Heyne-Verlag, Munich 1984, 272 pages, DM 7.80) in his book "Die Computer Spione" proves that this "watchdog" is "without teeth." Especially the FRG and even more so Switzerland have become the turntable of the illegal export of COCOM goods. Through packaging tricks, purchase by means of dummies and cover firms or the export through third countries, the procurement specialists find possibilities all the time to fulfill their own list of wishes at the expense of others.

Or by espionage: GDR industry estimated at about 100 million marks the value of the work of Gerhard Arnold, BS in engineering, who supplied his employers for nearly a decade with information and documents as a leading employee with IBM and later on as management consultant. His regular know-how shipments helped develop a GDR computer industry and save valuable time and development costs as well as modernize the data processing of the military.

Since the Eastern economic planners, just like their Western model, have taken up rationalization and use of robots, especially microelectronics and EDP are

of interest to their intelligence services. According to an investigation of the Bavarian Association for Security in Industry, of the cases of industrial espionage uncovered, 21 percent belonged to the field of electrical engineering and electronics, 15 percent to the armament industry, 12 percent to vehicle building, with 10 percent each for machine building, precision mechanics and optics and research institutes.

To the West German espionage expert and technical author Friedrich-Wilhelm Schlomann (Friedrich-Wilhelm Schlomann: "Operationsgebiet Bundesrepublik, Spionage, Sabotage und Subversion" [Operations area FRG, Espionage, Sabotage and Subversion] , Universitas-Verlag, Munich 1984, 394 pages, DM 38)) it is not difficult to draw a conclusion: "By this massive industrial espionage the economy between Elbe and Odra frequently succeeds in saving research and development costs especially in those fields in which such costs constitute a high share in the retail price of the product concerned."

The view of some owners of Western firms that there was nothing in their enterprise to spy out, according to Schlomann underestimates extent and mission of Eastern industrial espionage. For a long time not only high technology alone has been of interest but also plant or branch-of-business internal market and competitive data, offers by firms, licensing contracts, investment planning or market research. The things that are to be spied out from the firms go into the most minute detail (see list at end of article).

Personnel information is of special interest. Thus an about 53-year-old district manager of the Deutsche Beamtenversicherung in Trier had the task to forward personnel data on policyholders to the MfS in East Berlin. When in the fall of 1983 the prototype of a newly developed instrument for processing of glass-fiber cables disappeared at the ANT Nachrichtentechnik GmbH in Backnang, a 43-year-old staff member from the development area was arrested. He also had in his possession notes on the professional and personal field of colleagues.

Such information, there are no ifs and buts about it for the former director of detectives, Georg Pohl, as a rule serve only one purpose: paving the way for the recruitment of a new agent.

Pohl is the manager of the "Working Group for Security in Industry (ASW)," the top organization of seven German security associations and knows the tricks of the other side from long experience. "Before they recruit someone," says Pohl, "they investigate him more thoroughly than we do in case of a security clearance." Informative are apparently especially details on the way of living of the potential candidate: e.g., debts, expensive hobbies or a girl friend. The recruiters do not always reveal their true face but hide, for example, behind the mask of a Swiss scientist, market researcher, management consultant or research institute with designations that sound harmless. After consciously invented accidents or criminal acts during travel in the East, they finally come to the point.

More difficult to develop but in final analysis all the more efficient are those prospective agents who are not supposed to reach their goal--the job in

a security sensitive area of the enterprise--until 10 to 12 years later and after several intermediate stations. The East Berlin economist Detlef Scharfenorth, 42, for 9 years was--under a false name--a welcome source of side income for students of West German universities with his requests for studies or technical articles. In September 1984, the cover of the recruiter of prospective agents was blown.

Of course, the Eastern intelligence services acquire a great deal of their information from completely open sources by systematically analyzing general press organs, technical periodicals, promotion material and plant newspapers in the FRG. Whatever is then lacking must be obtained or confirmed by industrial espionage. This is frequently accomplished by the "mosaic method," as Herbert Ebner of the Bavarian Security Association knows. "From different small pieces there suddenly emerges a total picture that must be classified as confidential and regarded as a security matter."

In view of completely new possibilities of information procurement, President Hellenbroich of the Federal Office for the Protection of the Constitution foresees the worst. By means of the growing number of technology data banks, he is afraid that an industrial spy could "obtain practically on request completely developed know-how from the most varied fields." With the knowledge so obtained, the protector of the constitution warns, the East Bloc states could "continue to develop their industry and technology virtually without research efforts of their own."

In final analysis, it actually does not make any difference to the enterprises whether their products are copied in a Bloc state enterprise or by competitors within the country or in Western foreign countries, if in this manner they lose know-how, competitiveness, jobs and, in the extreme case, their livelihood. Pohl considers the circle of the endangered as rather wide. "Every production or service enterprise that can stand up well in the present competitive situation and makes profits constitutes a business and enterprise secret."

But the boundaries between legal procurement of information--e.g., by technical talks with engineers of the competitor or by requesting bids through an affiliate--and industrial espionage are fluid. Transmittal of plant secrets is liable to punishment only if a state secret in the meaning of the criminal code is involved.

Betrayal of industrial secrets according to Article 17 of the Law Prohibiting Unfair Competition (UWG) is no offense requiring public prosecution and is prosecuted only on application. But that is quite rare. From worry about their good reputation and fear of endangering business relations, hardly anyone wants to broadcast such a case. Experts of the industrial crimes department of the federal justice ministry estimate the number of unreported cases at 95 percent. Nonetheless espionage among competitors is a rampant cancer.

For example, the big mail order house Quelle spent DM 300,000 to find out in what mysterious way the Pforzheim mail order house Klingel obtained the addresses of 325,000 customers of the Fuerth firm who place collective orders. The Pforzheim firm obtained the data for DM 164,000 from a Swiss dummy

corporation. Suppliers of this valuable information were Quelle employees who filched a hundredweight of microfilms, magnetic tapes, punched cards and business letters from business cabinets and desks.

A textile manufacturer from Bruckmuehl near Munich had developed a new product, a nonflammable wool blanket in which especially airlines were strongly interested. But while the Bavarians were still celebrating their success, a competitor from Heidenheim with exactly the same, but DM 5 cheaper, blanket did the business. Considerable losses and the threat to jobs were the consequence.

Cause of the debacle: for about 2 years a leading staff member of the Bruckmuehl firm had constantly provided material and product information to the competition in Wuerttemberg. Result: an out-of-court settlement with an indemnity payment amounting to millions.

With Daimler-Benz, the director of the car designing department, Joachim-Hubertus Sorsche, asks himself even now how the competitor BMW was able "to present ahead of us" the antilocking system (ABS), "predominantly an invention from our house." The Daimler man has his own suspicions: "Some suppliers occasionally talk about the direction of development in the hope of being able to sell the thing also to our competitors and thus to achieve larger lots."

Among close associates the Daimler-Benz chairman of the board Werner Breitschwerdt is also worried about industrial espionage: "A problem we must increasingly reflect on in the future. Probably many more things disappear from our development than we believe."

Such utterances may perhaps be the beginnings of a new security consciousness. But the Munich attorney Peter Kragler (Peter Kragler: "Wirtschaftspionage" [Industrial Espionage], Criminal Field, Schaefer Verlag, Stuttgart 1982, 364 pages, DM 168), one of the legal experts in this field, considers it "a dangerous fallacy to insist on the academic discussion of the dangers of industrial espionage and to assume that it suffices to familiarize the leadership of an enterprise with these problems and to arouse their suspicions." Plant espionage, Kragler knows, as a rule starts at the front: in the field service, in sales, at fairs, in the post office, in cost accounting and in the data center.

Walter Glomp for 20 years was in charge of security at the Krauss-Maffei AG armament firm in Munich. Now the pensioner heads the Institute for Security Research, registered association, (IFS) in Feldkirchen near Munich, with a staff of about 100 security officers. Management, that is the way he describes the situation, regards security frequently as a necessary and expensive evil, "the expenses for this purpose are to be kept as small as possible." With his elitist circle, Glomp wants to "study existing rules and make them helpful to industry." Especially to the security officers who, according to his experience, in their daily business quickly reach the limits of their capacity and find no time "to deal profoundly with new trends."

Such developments and consequences resulting therefrom are disseminated by the IFS with its twice monthly small newspaper DIE SICHERHEITSLAGE. Glomp

is quite sure of himself. "In the United States we observe a real atmosphere of change of attitude. That can't take much longer here either."

But there are quite a number of obstacles on this road. For example, the protection of data which some security experts like to call protection of criminals. Security association chief Pohl complains: "Industry does not get any information from authorities, whether someone is reliable or not and whether or not a new staff member preferably should not be employed in a security-sensitive position.

The federal labor court has put a stop to an overly energetic use of computer-supported control systems to watch over employee behavior (WIRTSCHAFTSWOCHE, 46/1984). Without approval of shop councils hardly anything takes place now--the labor unions have issued the clear slogan to prevent everything that could create the "transparent man."

A staff member of the former chairman of the board of Dornier, Claudius Dornier, with all good intentions to desire to stop industrial espionage also sees dangers. "The people in a think tank cannot be expected to permit the gatekeeper to look into their pockets all the time." The best security maneuver continues to be "to see to a good plant atmosphere and motivation of the staff members and for continuity of the awareness of the problem."

Especially the problems with industrial spies are the business of Joachim Habighorst, the managing partner of the Hagen Zentraler Sicherheitsdienst (ZSD) [Central Security Service]. The long name of the firm (Company for International Industrial Investigations, Security Analyses and Defense Against Industrial Espionage GmbH) is to describe the activities comprehensively. In the James Bond manner, the 33-year-old trained insurance detective is never at a loss for pithy words: "Our services are usually requested after the child has already fallen into the well. Then we have to get things straightened out again." What he has in mind, e.g., are investigations if a manager assumes sales losses are caused by industrial espionage. With his ten-member, predominantly free-lance, field service staff--people formerly detectives and with the Office for the Protection of the Constitution--and a radio technician Habighorst soon expects to have a turnover of DM 2.5 million and, according to his own statements, has spent DM 250,000 last year for advertising his services. A gold Rolex wristwatch, a Porsche with car telephone, and a calling card printed in Japanese are to demonstrate that business is apparently good. Habighorst has a lot of stories to tell. Like the one in which a ZSD agent for three weeks sought and found the friendship of the manager of an electrical firm at Portugal's Algarve. He was suspected by a fellow partner of selling design documents and almost complete patents to the competition dirt cheap. When the suspect later on accepted such an offer from his alleged vacation friend, the trap was sprung.

Habighorst likes to show off the instruments of his profession: an DM 80,000 video camera with pinhole lense, low light level intensifier and a recording capacity of 300 hours. Or the computer in which he has stored 30,000 German firms with annual sales of over DM 5 million: "Our potential customers."

As head of the property protection function and thus also the man competent for defense against industrial espionage with the IBM Deutschland GmbH, Juergen Tobias prefers to rely on his own firm. Tobias: "For years the topic of reliability is a criterion of equal importance to our personnel field as mobility, intellectual grasp, technical knowledge and readiness for cooperation."

The prerequisites for effective security work--for example direct right of presentation to the management and its approval for direct investigations in the enterprise--are present in IBM. Nevertheless prevention is of greater importance to Tobias: "We inform our staff members in conversations, training courses and information literature about corresponding incidents and train them in handling confidential information." According to Tobias, IBM employees are prohibited from accepting secrets from others--e.g., suppliers. A further plus to defend against undesired temptations: "Our enterprise provides generally generous help to staff members should they get into serious difficulties" (Tobias).

The future will show whether all that is enough. Not a few security officers wistfully recall the days when the dangers of industrial espionage were permanently painted on the wall and the staff members were sensitized with slogans such as "Enemy Listening." CDU/CSU security expert Willy Wimmer also sings a similar tune: "The parts of industry affected," he demands, "should really behave somewhat more patriotically."

Explosive Checklist

Excerpts from a list of questions for Soviet agents on the first phase of spying out internal plant details in Western production enterprises (according to a reconstruction of the Institute for Security Research (IFS).

1. Data on the enterprise:

Name and address, status of ownership and shares, name and home address of the owners, of the management or board of directors and of additional important and leading persons

2. Location of the enterprise

3. Blueprint of the enterprise

4. Survey of the sales program: description of the various products; vertical range of manufacture for each product; suppliers of materials, hardware, and semifinished products earmarked for the production; quality of the products, customers and quantity of the purchased products per customer; description of the individual commodities, suppliers, quality and customers of the commodities per customer.

5. Warehousing

Stockpiles and consumption of raw materials, hardware and finished parts as well as accessory materials and operating supplies. Suppliers' monthly

delivery quantities and consumption; size of storage area and allocation according to finished products, fabricated materials, raw materials and commodities

6. Personnel

Number of white and blue collar workers, broken down by occupation and nationality; number of apprentices, broken down by future occupations; if applicable data on military specialists

7. Energy

Types and quantities of needed bulk energy as well as selfproduced energy

8. Capacity of the enterprise

Description and utilization of the individual machines, listing of reserve machines, number of shifts in production; personnel and production capacity of the enterprise per shift

9. Production in a national defense emergency

Planned capacity, personnel, products, expansions or reductions

10. Information on traffic conditions

Individual traffic (pedestrians, bicycles, cars); public transportation; access roads for trucks, including capacities of the nearby bridges and overhead crossings; railroad tracks (siding track, nearest railroad station), connection to the nearest airport for passenger and freight transport

11. Regulations within the framework of civil defense

12. Miscellaneous

Personnel and range of duties of the designing offices; photographs, graphic representations, data on the works council, on middle and low management; data on as many members of the staff as possible.

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CSO: 3698/271

END